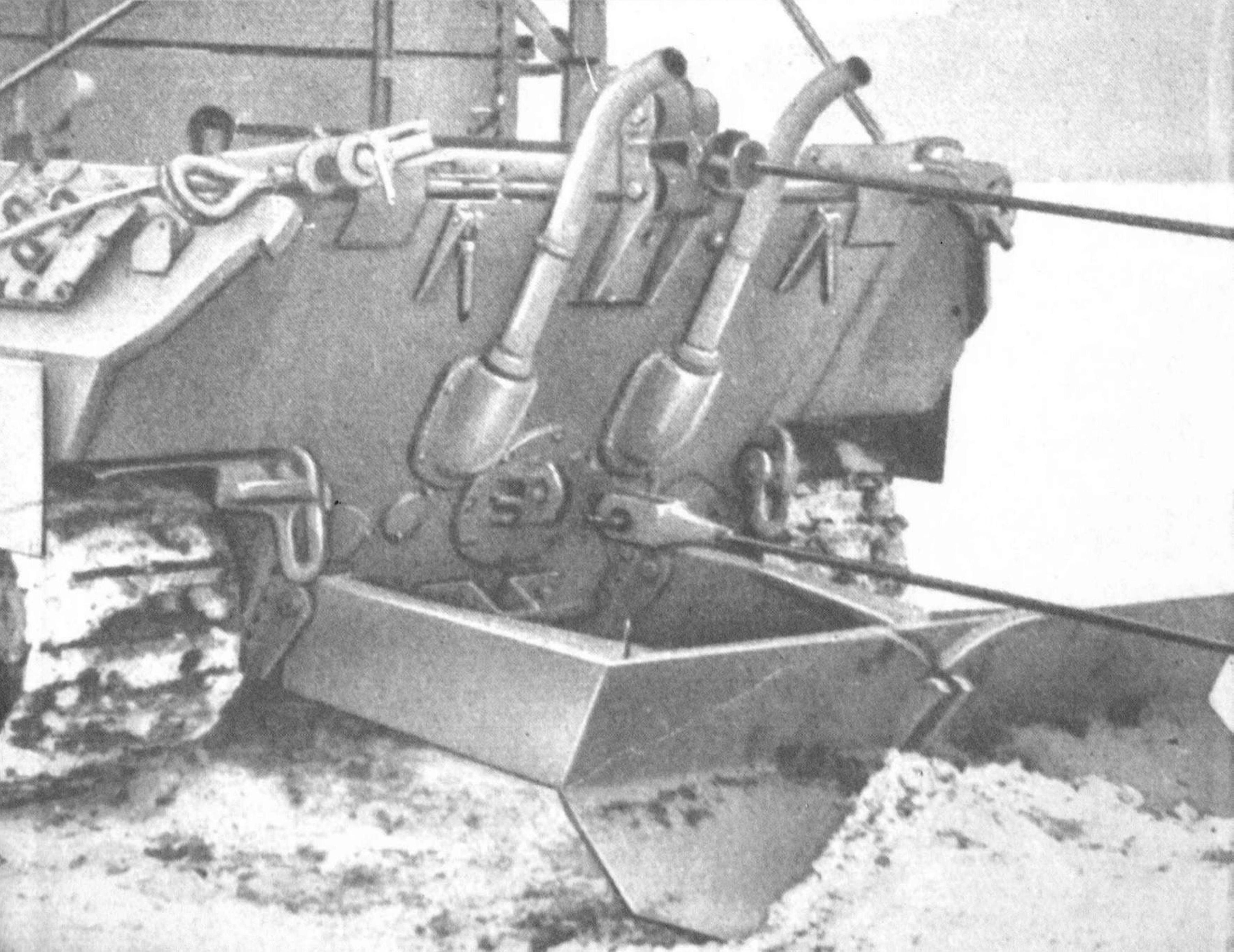
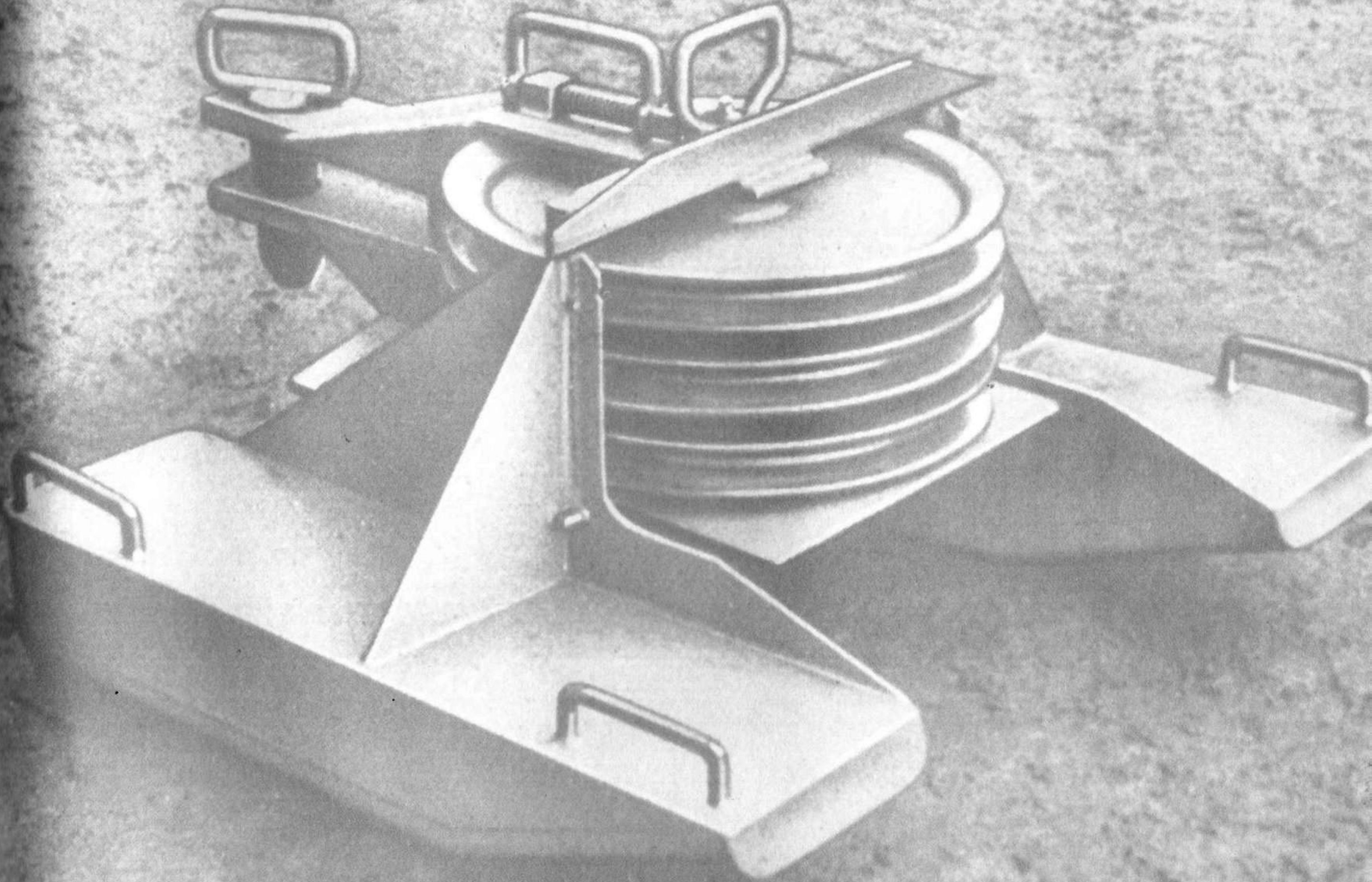
REPAIRING THE PANZERS

GERMAN TANK MAINTENANCE IN WORLD WAR 2

BY LUKAS FRIEDLI

VOLUME 2





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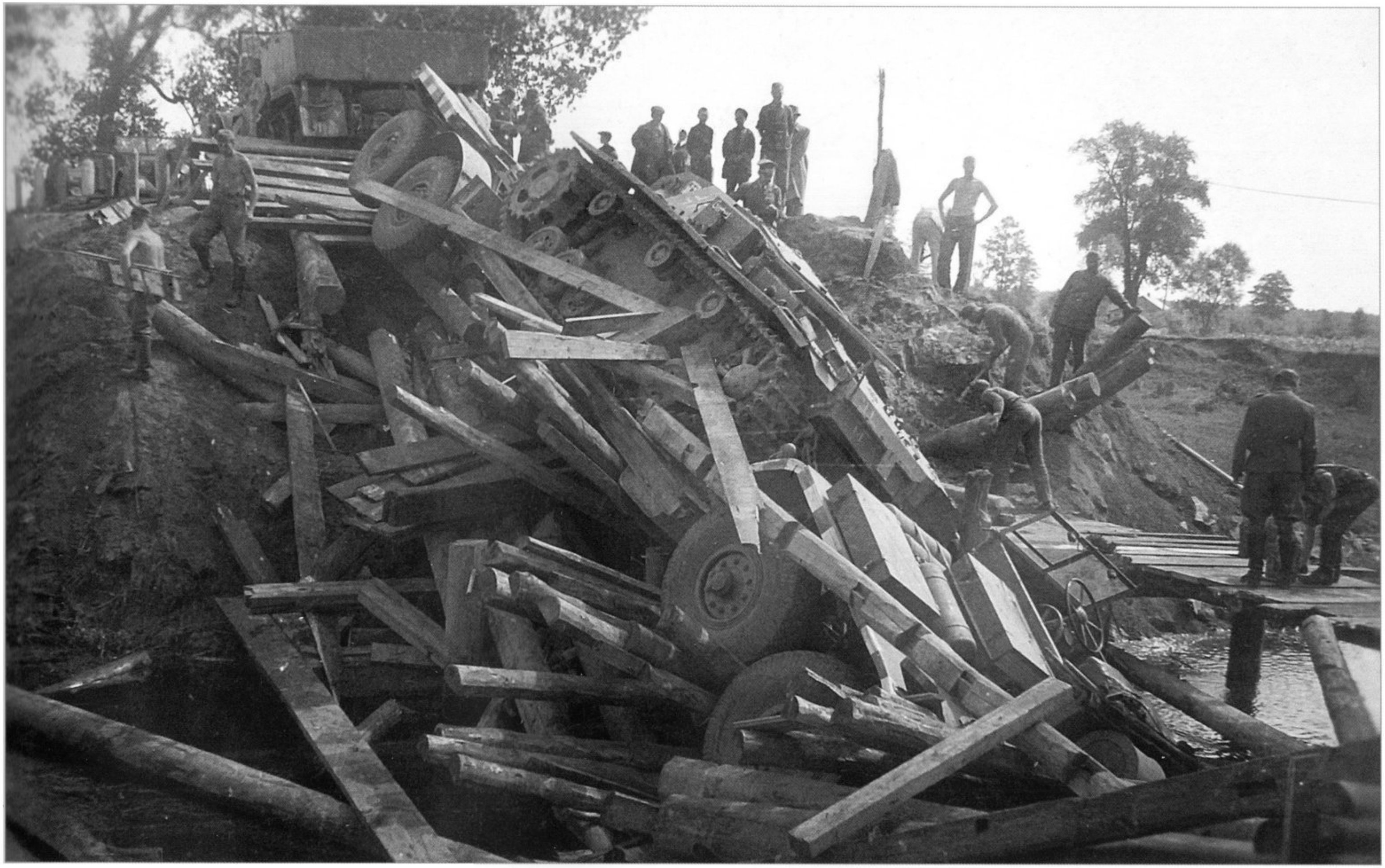

▲ A damaged StuG III Ausf.B also led to a damaged bridge. It is a wonder the StuG remained on the trailer. The name 'Gertrud' is painted on the side of the assault gun and a Tiger head emblem identifies the vehicle as being from StuG.Abt.210. *AMC*

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OBJECTIVE OF VOLUME TWO

This book is Volume Two of 'Repairing the Panzers' (RtP) and contains the rest of my findings not yet presented in Volume One. Both volumes shall be understood as a whole. While Volume One focused on the build-up and organization of repair units on all levels of the German Army, Volume Two continues with the tactical deployment of the repair units and the factors that affected the operational readiness of Panzers. Experience reports stretching from Poland in 1939 to H.Gr. Weichsel in 1945 are a highlight in regards to spare parts and supply documentation. This section completes the Pz.AOK.4 Abt. V diary begun in Volume One, which presented Panzer repair from a bird's eye view during the Battle of Kursk in 1943. The sheer number of documents and rare photographs demanded that we divide this one book into two volumes.

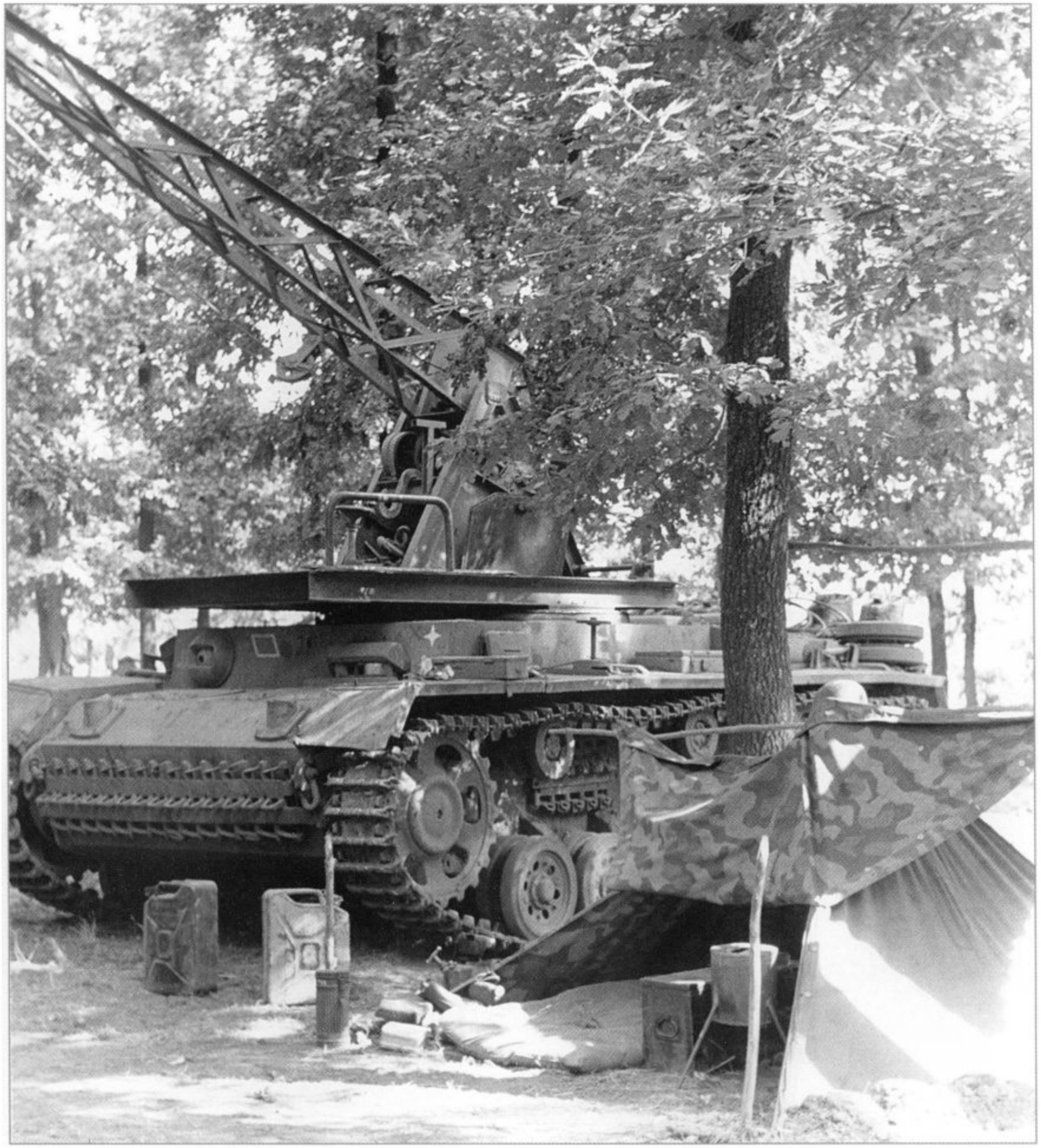
Volume Two is based on primary source documents written during the war, such as official orders, war diaries, minutes of meetings, presentation notes and experience reports. Sometimes veteran accounts and minutes of prisoner interrogations are given even though they are not considered primary sources and remain the personal memories of the veterans. They serve merely to illustrate what made an impression on them. In Chapter Four I partially fell back on an extensive article written by Oberstleutnant a.D. Franz Luckner 'Die Versorgung der Wehrmacht mit Kraftfahrzeug-Ersatzteilen im 2. Weltkrieg' (1972). During the process however, almost all his statements used could be supported by original reports. The small extracts from Luckner are clearly indicated in the text.

To make the information more accessible to the reader, this book has been structured into chapters and arranged by subject matter. If a passage or two seem to be in the 'wrong' chapter, it is because the original reports and minutes of meetings usually covered a multitude of topics, and for the most part we have left these original documents intact rather than splitting them into different chapters. Directly quoted original documents are given in a different font and quotation marks are omitted. To make reading them easier and because a report is almost never quoted as a whole, larger continuous excerpts are not indicated with ... at their beginning and end. If parts in between the text are omitted, then they are indicated by ... . Clarifications added by the editor (me) are kept to a minimum and put between brackets. Reports from government officials or officers at the front may at times appear somewhat stilted or awkward. In translation, the sentences have sometimes been cropped but often remain long and complex. We tried to keep the tone of the originals while remaining understandable at the same time. To make reading more fluent, some terms have been translated into English even though they do not have an exact equivalent in the American or British army, e.g. workshop company for the German "Werkstattkompanie (Wkst.Kp.). However, to remain precise, some German terms have not been translated but are explained in parentheses. Another reason for this approach is that, once a term is translated, it may be so general that the original German meaning is lost. For example: the term "maintenance section" is too general, and does not distinguish between I-Gruppe, I-Staffel or Wkst.Zug, all of which you will have learned about in Volume One.

Sometimes the original German text is ambiguous. If these ambiguities could not be resolved easily, they were left as they were in the quoted text and not interpreted. This would be speculation.

Please allow me to finish this introduction with the first response of Martin Lange (Panther mechanic with Pz.Abt.52 in Kursk and then 11.Pz.Div. until the end of the war and who got me started on the whole subject), after having read my first manuscript that resulted in 'Die Panzerinstandsetzung der Wehrmacht'. "Where do you get all this information from? That's exactly how it was." Well, these days I do not have the expectation of being able to tell you how it was exactly, but to give you enough insight so that you can understand the challenges of Panzer maintenance and thus Panzer warfare better - and just for the fun of it.

I wish you an interesting reading experience, while the search continues.



▲ Left to their own devices, the personnel of a workshop could be very resourceful. Here a rotating (?) crane platform has been mounted on a Pz.III in place of its turret. As it was not apparent enough, a 'J' is painted on the front armor (Kursk, 6.Pz.Div.). *ECPAD*

Foreword

It may seem strange that a minister of the Swiss Reformed Church adds a few lines to this volume by Lukas Friedli, but it happens that - being of German, Prussian origin - I inevitably became acquainted with Panzers through the manifold trauma-ridden war-recollections of my father's friends, even if none of my family fought with the Panzer. These recollections included the myth of the German Panzer, be it the story of waves of them surging irresistibly east, or the story of single 'Tiger' as sheltering fortress for harassed infantry men in constant retreat. The mythical role of this weapon still lingered in post-war Germany. And of course it was said: "Ours, in spite of all, were the best!"

Myths of war are to be deconstructed (to use a fashionable term). First of all - talking of World-War II - the ideological myths of Nazi origin that justified the hitherto unknown brutality of war-making, especially the 'Untermensch' phantasma, the notion that, among other 'races', Slavs were to be treated as sub-human, a notion that became virulent when the aggression turned eastward. The conceit of technological superiority belonged to it, of course, and it is interesting how German officials reacted when superior Red Army tanks (T-34) were met in the first weeks of Operation 'Barbarossa'.

Myth-deconstruction of Panzer warfare presupposes close scrutiny of the conditions which made the appearance of this more and more complicated weapon in the field possible in the first place. If boys of any age today are interested only in firepower, horsepower and armor thickness, they are missing equally important considerations such as methods of construction, production, manning, training, and supply (Am I right? I ask the experts) - and, as Lukas Friedli reveals with his most scrupulous research, maintenance and repair. Far from being boring for a layman in these affairs, his enlightened discourse offers a glimpse into the brute facts of an only too important technical side of war on the German side, giving me a lot to think about - and a few questions to ask.

A mentality of labour and endurance under horribly stressed circumstances can be inferred from the documents. Typically German? (It would be helpful to learn about their Russian counterparts and their circumstances). Now see the chaos of war-administration in Nazi-Germany as it is documented here and you would have to ask: How did the men in the repair units react? What became of their 'spirit'?

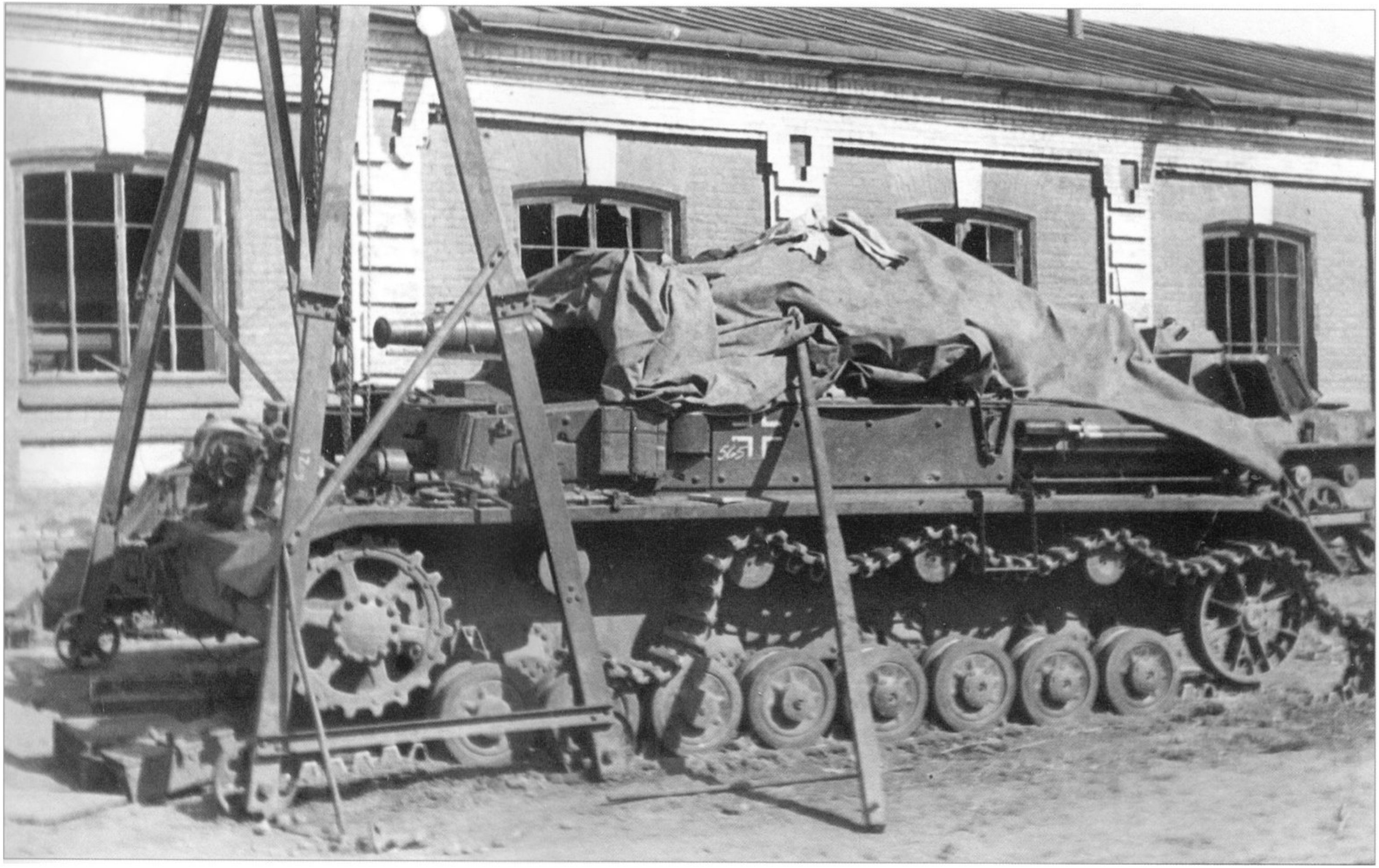
What influence did ideology really have in this technical side of war-making? Were these technicians mere experts, free from hate and prejudice? Were they just 'Handwerker' of war, simply proud of good work? Had they been immune to the invidious and oft-repeated propaganda since 1933?

Or did their special position in the military organization make them think about the system they were involved in at all, so that they came to develop an inner remove? What I mean is this: These men were not only close to wounding and death, the waste of human lives, but they were also most intimate with the material waste of war, symbolized in the panzerwrecks they cared for (or which they had to give up or destroy). These men came out of a relatively poor society, where in peacetime virtually no material of worth had been wasted. Frugality was part of their German mentality. They had - now in war - orders to save material at all costs, but were too often denied the means to do so. The inevitable losses that followed, due to incompetence 'above', may have made them disgusted and, as a consequence, reflective.

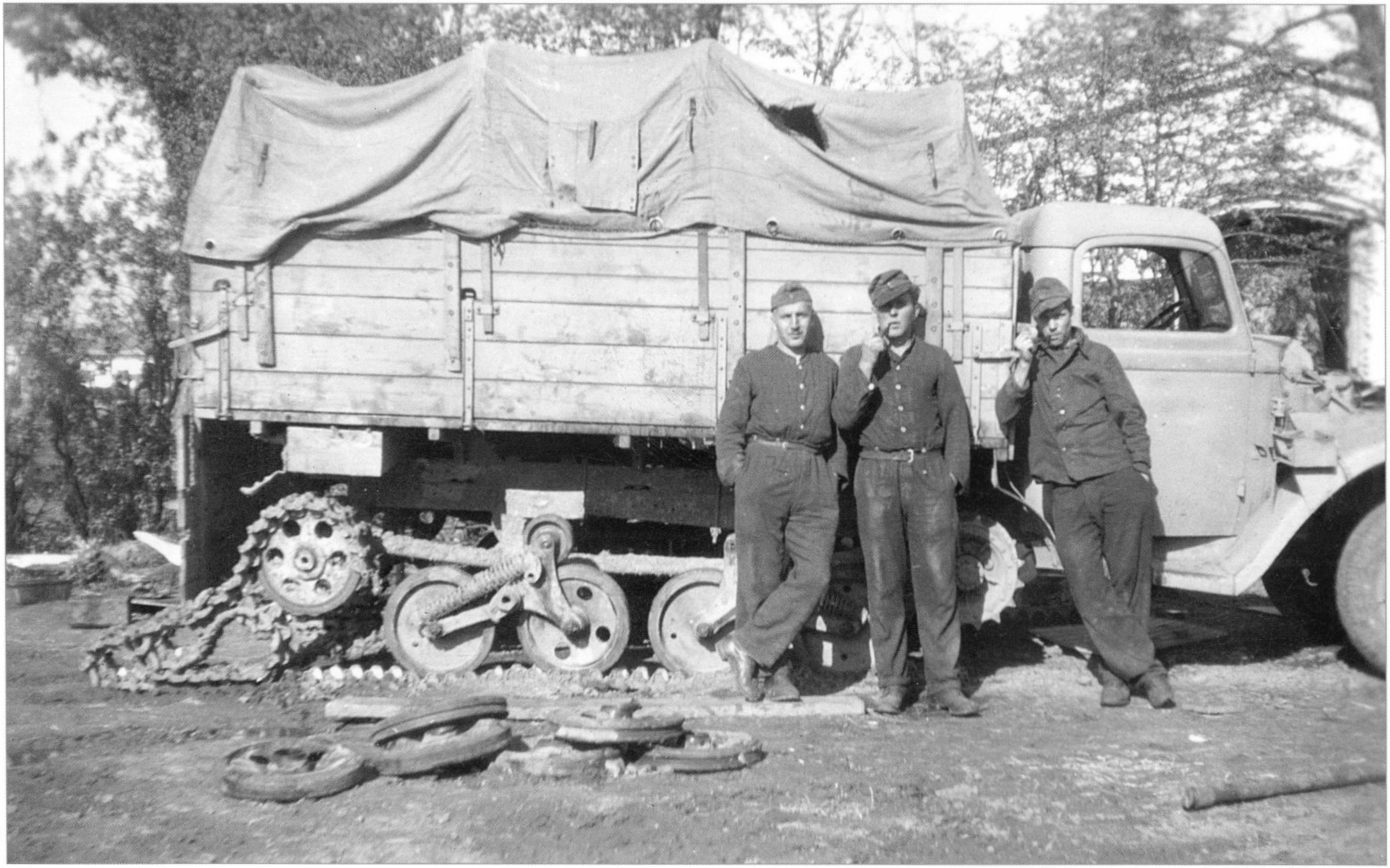
By the way, Germans could witness but not fully understand wasteful American practices. What Germans saw was part of another mentality, a mentality born not out of need but of abundance. The Western Allies (and more and more the Red Army too) could rely on their prodigious 'production line' output, (as Mr. Auerbach puts it in his foreword of Volume I), to replace their losses.

In short: The reading of these two volumes leads me to a fundamental question, of which I do not expect to find the answer soon: What made these men toil, endure and fight?

Joachim Koenig, Zürich 2011



▲ A Tauchpanzer IV, a submersible version of a standard Pz.Kpfw.IV, is kept under wraps during repairs. Note the bung in the muzzle and the extended superstructure roof plate under the turret. The split upper portion of the portal crane is rather odd. *PD*



▲ A 3t Lkw 'Maultier' of StuG.Abt./Brig.210. According to a travel report to HGr South Ukraine from 7Jun44, the Ford Maultier produced in Germany and the Netherlands had non-interchangeable spare parts. *JH*

Deployment of the I-Dienste

1

Leadership 12
On the March 18
In Winter 19
In the Desert 31

Leadership

The training manual for the Panzertruppe from 18 January 1941 (H.Dv.470/10) stated that

> *... during the battle, the I-Gruppen are part of the fighting troops. Their deployment is ordered by the Abteilungs-Kommandeur. The Abteilung's engineer is the leader of the I-Gruppen who decides which vehicles are sent to the Panzer-Werkstattkompanie for repair. He liaises with the Abteilungs-Kommandeur and the regiment's engineer.*

The I-Staffel of the Abteilung was led by a Werkmeister. He received his orders from the Abteilungs-Kraftfahroffizier (by order of the Abteilungs-Kommandeur). The Panzer-Werkstattkompanie was led by an Offizier der Kraftfahrparktruppe. He received his orders from the Regiments-Kraftfahroffizier (by order of the Kommandeur).

▼ A photo of war correspondent Hurtmanns from Tunisia, 15 March 1943, showing a platoon of captured American halftracks and Jeeps. *NARA*

On 18 March 1943, the Kommandeur of s.Pz.Abt.501, Major Lüder, reported about their experience with the Tiger in Tunisia:

> *The I-Dienste during an operation:*
> *For an operation all I-Dienste are grouped together under the leadership of an Instandsetzungsstab, that maintains contact with the fighting troop by radio and motorcycle messengers. The fighting troops of each company are closely followed by Instandsetzungs-Hilfs-Trupps (maintenance auxiliary troop) which carries the most important spare parts for first aid. For their mobilization, captured armored half-tracks have been put to use successfully. The bulk of the I-Dienste, to which workgroups of the Werkstattkompanie and a part of the Bergezug are attached, follows hard on the heels of the Combat Train I. The less mobile parts of the mobile Werkstattzug follow the Combat Train II closely as long as the fighting and road conditions permit it. This is where the central spare parts supply is located. It is replenished by fast mobile Kfz. bringing more supplies from the storage of the stationary Werkstattzug. Additionally, the rest of the Bergezug and the heavy hoist are stationed there (and maintain radio contact with the Instandsetzungsstab). ...*
>
> *During the operation, easier work such as suspension damage, thrown tracks etc. are repaired by the Hilfstrupps following behind. For light damage on the engine or transmission, the Instandsetzungsstab sends a specialist.*
>
> *For heavy damage that can be repaired without the heavy hoist in several hours, the bulk of the workgroup is used. If the damage requires the heavy hoist and the Tiger is under enemy fire, the Pz.Kpfw. must be recovered to a cover where the ground is compact enough to deploy the hoist. The Tiger is then repaired by men of the mobile Werkstattzug. The Instandsetzungsstab follows the advance with the bulk of the I-Dienste.*
>
> *If the area in which the Tiger was lost cannot be held, it has to be recovered to the rear. In a place completely safe from the enemy, maintenance can be performed, even if it takes 1 – 3 days. If spare parts are not available, the Pz.Kpfw. must be recovered to the*

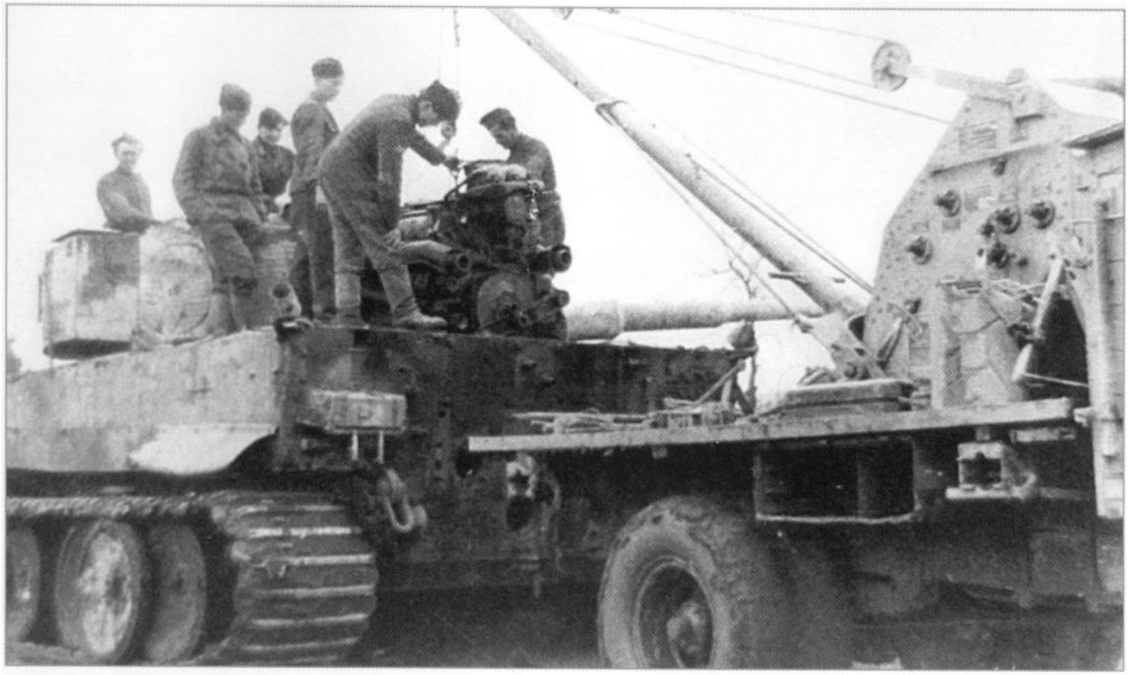
> *stationary Werkstattzug. If there is a Tiger at that Werkstattzug with the missing spare part in place, it is useful to dismount that part and install it in the damaged Tiger. By doing this, recovery of the Tiger further to the rear can be avoided and the damaged Tiger can be put back into action considerably faster. Fuel, road wheels and time can be saved.*
>
> *Core principles for Tiger maintenance are:*
>
> 1. *Maintenance must be performed at the location of the break-down.*
> 2. *At least one spare engine and one spare transmission must be brought along.*

The training school at Paderborn made a summary of reports filed by s.Pz.Abt.501, s.Pz.Abt.502 and s.Pz.Abt.503, dated 8 June 1943, which also mentions the deployment of the Werkstattkompanie:

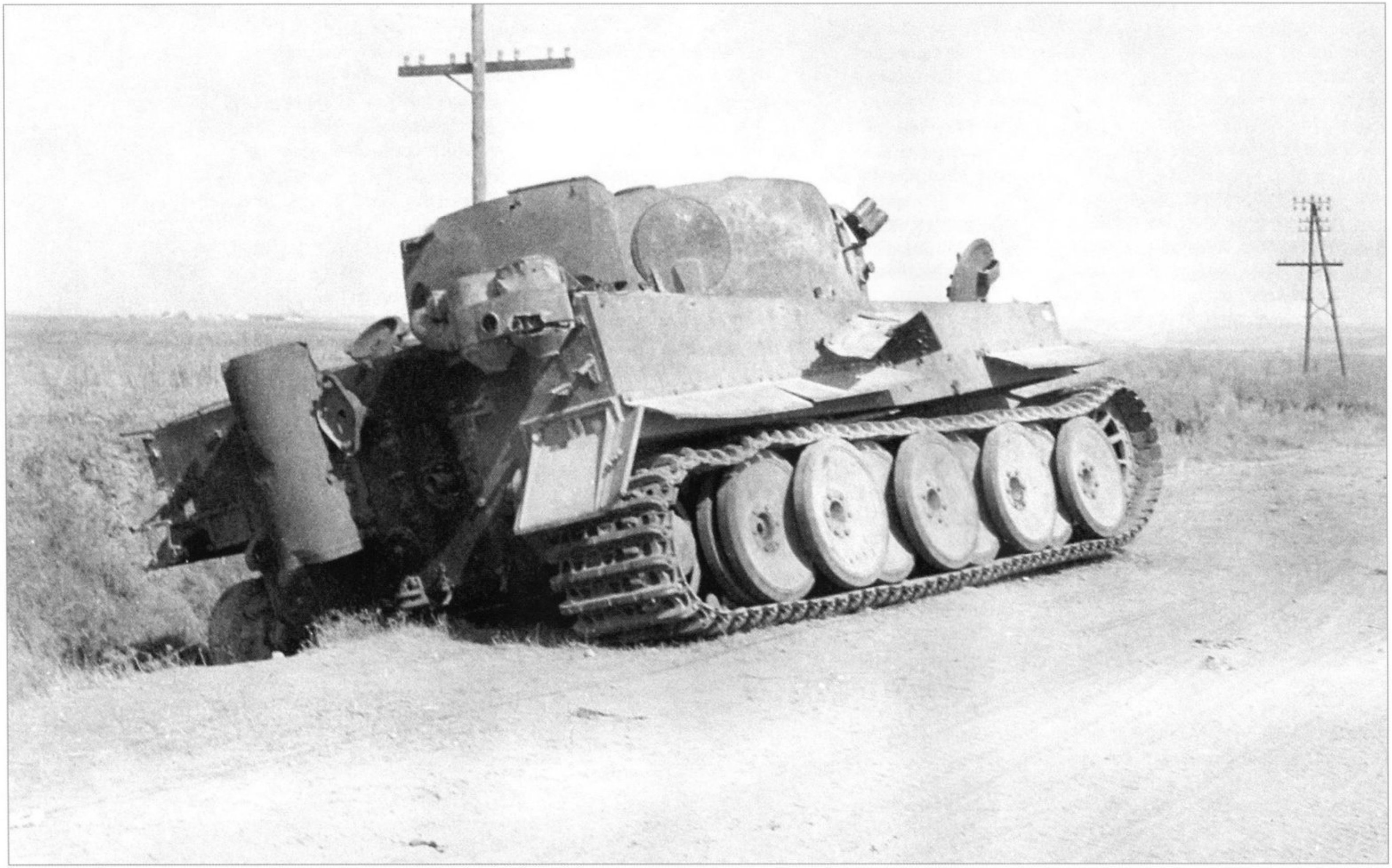
> *One Zug of the Wkst.Kp. is deployed stationary as the maintenance base. If possible, it is located at a train station and near a good road. This Zug, well camouflaged, has to be able to use its heavy chain hoist. Covered halls with hard ground are essential for undisturbed welding during the night and continuous work independent from the weather. The big party rally tents turned out to be useful as makeshift facilities. This Wkst.Zug stays in place until the recovery distances become too great. The other Wkst.Zug follows the fighting elements in leaps. Some specialists of the Wkst.Kp. are with the I-Gruppen of the companies.*

The s.Pz.Abt.506 reported on their experience with their own recovery and maintenance unit on 15 January 1944:

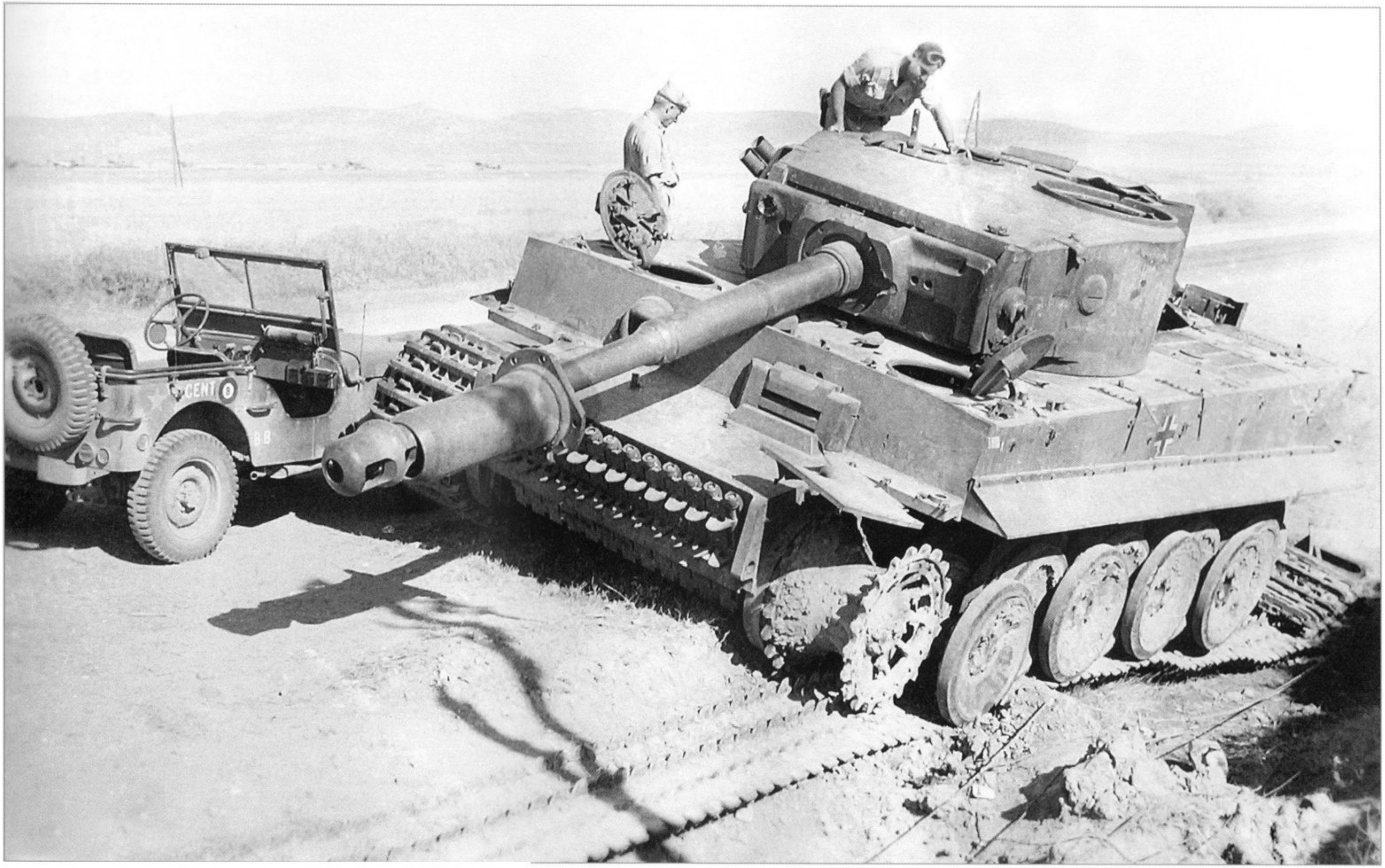
> *Recovery platoon: The Abteilung has five Zgkw.18t and two Kran-Zgkw. For recovery purposes normally just four were operational. Under the current mobile warfare, this recovery group does not meet the requirements. That no Tiger had to be blown-up during the fighting east of Winniza is only thanks to a fortunate circumstance and the efficiency of the recovery group, which worked four days and nights and lastly in the face of the enemy to recover the Tigers under the protection of the reconnaissance platoon's GBW [sic]. In these days the platoon earned its 'Sturmabzeichen' (assault badge). A reinforcement of the recovery platoon to nine Zgkw. 18to. plus two Kran-Zgkw. is absolutely necessary, otherwise the self-destruction of vehicles can no longer be avoided in the future, especially when the Abteilung is refitted to its original strength, which is expected to happen soon.*
>
> *Deployment of the I-Dienste: One Wkst.Zug is deployed close to the front, at the railway, often reinforced by specialists from the 2.Zug, who stay further back and repair Panzers that need long-term maintenance, if the transport situation and the recovery vehicles permit it. Otherwise they repair the wheeled vehicles.*
>
> *The I-Staffel and I-Gruppen are close to the front to repair light and medium damage in situ without longer recovery or marching distances and if the enemy situation permits it. The equipment*



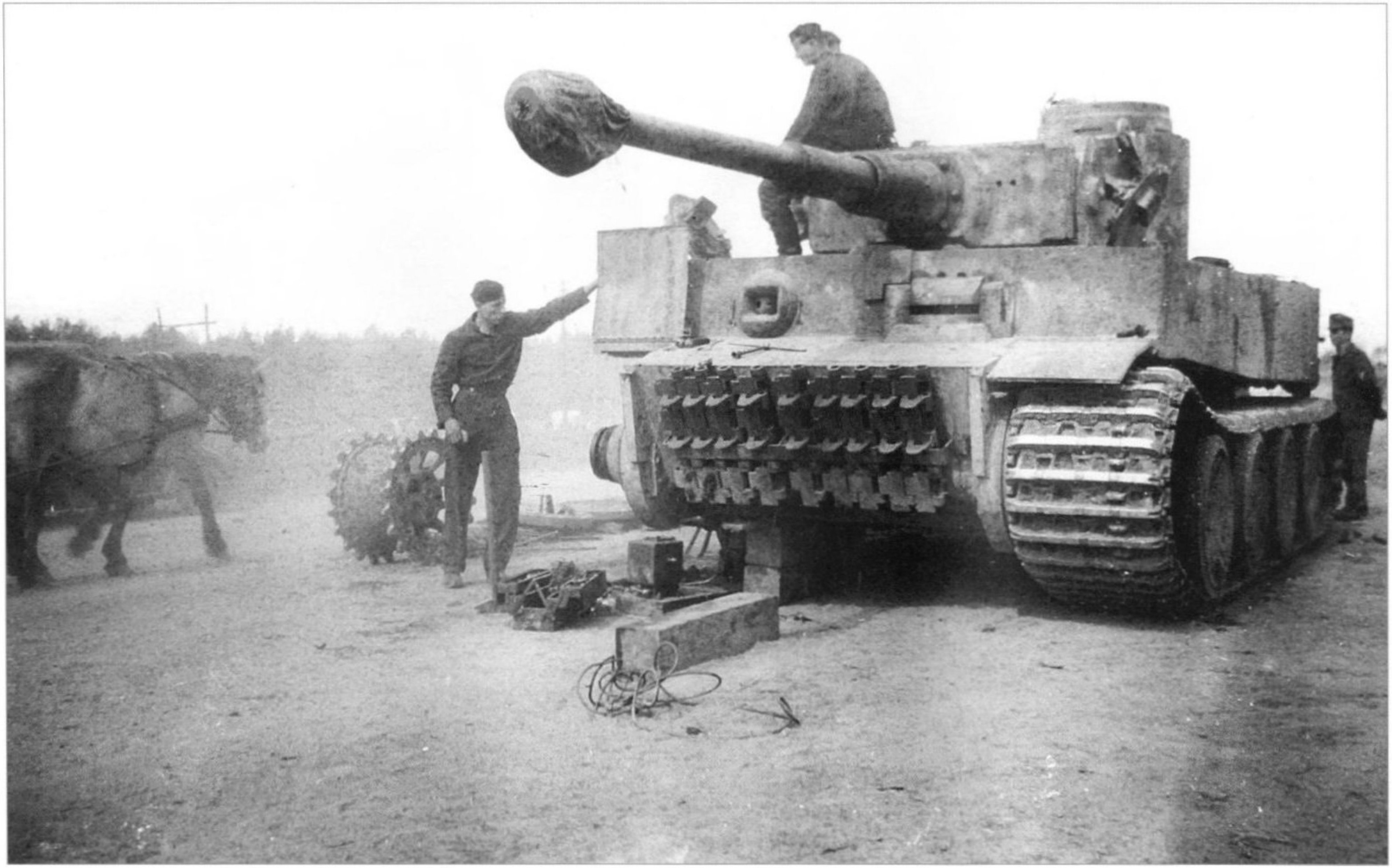
▼ Tiger 'A31' of III./Pz.Rgt. Grossdeutschland has its engine removed (or refitted). Note the missing road wheel, the removed exhausts and the dirty whitewashed paintwork. *AMC*



▲ This is Tiger ‘121’ of s.Pz.Abt 504, which was one of eleven Tiger I’s shipped to Tunisia in early March 1943. It was supposedly photographed in April 1943. The Abteilungs used a white rhomboid on the hull side, followed by a ‘1’ for 1.Kp. *AMC*



▲ This Tiger was probably blown-up by the crew (note the missing cupola) after suffering at least two hits on the gun mantlet. The stowage of spare track links on the bow was a field modification. *AMC*



▲ One of the very first Tiger I's to see combat. Originally numbered '111' it was one of five survivors of s.Pz.Abt.502 (numbered 1 - 5) in the Spring of 1943. The armor patch by the driver's visor makes the hull easily recognizable. *AMC*

> *and personnel of the I-Dienste is sufficient.*

A last insight into the tactical deployment of the maintenance units of a Tiger Abteilung is given by the former commander of 3./s. Pz.Abt.503, Richard Freiherr von Rosen, and the Abteilung's former workshop company commander for five months, Oberleutnant Walter Barkhausen. They remembered in 2004:

> *Each Panzer company of the s.Pz.Abt.503 was assigned an I-Gruppe, which had one VW-Kübel, two 1t Zugmaschinen and one Lkw. Besides the Panzerwarte, a Waffenmeister and a Funkwart were also part of the I-Gruppe personnel. During the attack, one Zugmaschine remained in cover, approximately 2km behind the fighting Tigers. If the Tigers halted or one ran onto a mine, the I-Gruppe pulled forward independently. There existed no direct radio contact between the Panzers and the I-Dienste. Broken-down Panzers reported to the Abteilung's command post which then contacted the I-Dienste by motorcycle messenger. The second Zugmaschine and the Lkw were further back by the train. The train was also divided in two, so that one part could resupply the Tigers without delay.*
> *After each replenishment of the Abteilung, it soon suffered considerable losses so that the Tigers of all three companies had to be deployed in a single Kampfgruppe. This Kampfgruppe was led by one company commander at the time, who then also chose the I-Gruppe that accompanied the Kampfgruppe.*

In his experience report from 20 August 1943, the Kommandeur of Panzer-Artillerie-Regiment 103 gives an insight into the work and deployment of its I-Staffel:

> *The I-Staffel was divided into a rearward main I-Staffel and a forward I-Staffel. The forward I-Staffel was in charge of weapons and vehicle related maintenance of Panzers and self-propelled guns. It thus dispensed with the Waffenmeisterei. Its work place was thus in the immediate vicinity of the firing positions. This structure proved to be very successful and made the evacuation of Panzers and self-propelled guns with only little damage to the rear unnecessary.*

> *The K.St.N. of the different kinds of batteries and the Stab seem to meet the requirements overall. The Abteilung has to live with considerable less personnel and equipment though and went into combat with a deficit of:*

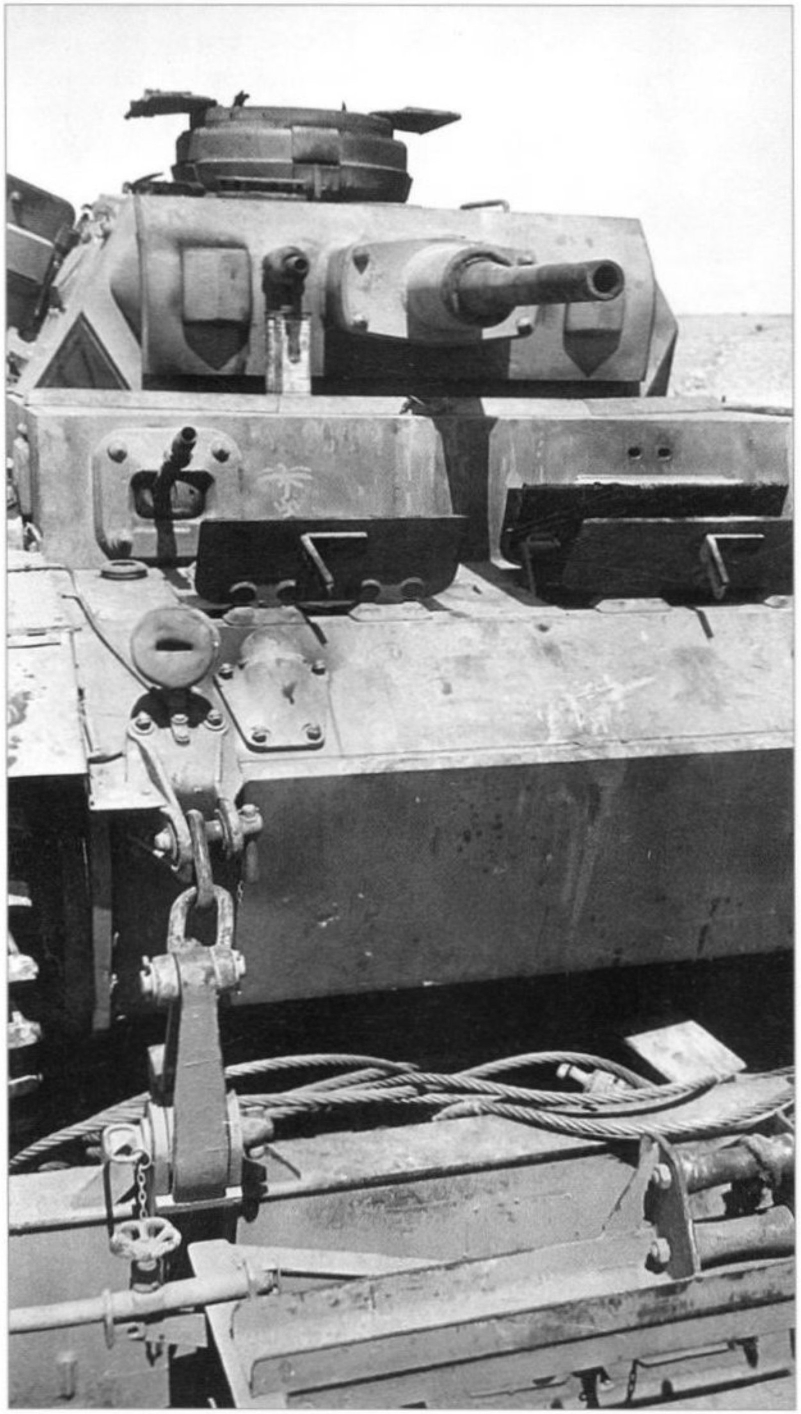
Personnel:

Radio operators	*16*
Drivers	*24*
Drivers (for Panzer)	*9*
Driver (Sf.)	*9*
Panzerfunkwarte	*9*
Panzerwarte	*6*
Signal mechanics	*5*
Electricians	*5*
Kfz. mechanics	*4*
Engine mechanics	*7*
Battery mechanics	*3*
Waffenmeistergehilfen	*4*
Blacksmith	*1*
Electro welder	*1*
Artillery survey section	*3*
Total:	*106*

Equipment:

Motorcycles with sidecar	*16*
Motorcycles	*2*
Pkw	*26*
Lkw	*8*
Ammunition carriers	*7*
Zgkw. (18t with crane)	*1*

> *Especially noticeable is the lack of specialists, Panzerfunkwarte, engine mechanics (for self-propelled guns) as well as the lack of ammunition carrying capacity. It was planned to pull out 2-3 guns per battery from the firing positions. Because of the constantly critical situation all 6 barrels were needed and it proved to be impossible. Neither was it possible to pull out the Panzers because they offer the only usable radio connection (30 watt set).*



▶ A Pz.Kpfw.III Ausf.H photographed in North Africa 31 May 1941. The 'Deutsches Afrika Korps' palm is visible on the driver's front plate but there is no division sign. *AMC*

On the March

Generally, the tracked and the wheeled vehicles marched separately. Each company of Panzers was followed by at least parts of the I-Gruppe. The I-Staffel followed at the end of the convoy under supervision of the Motor-Officer. Its duty was to repair broken-down vehicles. A repaired vehicle then marched at the end of the convoy and got back in its marching position at the next halt. If a vehicle could not be repaired immediately it was pushed from the road, prepared to be recovered and camouflaged against enemy aircraft to be recovered later. Under no circumstances could the vehicle block the march route. On longer distances, the Wkst. Kp. worked in leapfrogging deployment. The recovery platoon was recovering vehicles to predetermined forward collection points.

To show the deployment of the I-Dienste and the complexity of such a march, the 'geheimer Regimentsbefehl' (secret regimental orders) of Panzerregiment 15 of 25 March 1945 for a deployment into the area north of Frankfurt a. M. is presented here (Schrodek, History of the 11.Pz.Div., 327). Unfortunately the original could not be found, but because the order is unique and seems to be copied from an original, it was included.

Moving are:

1. *I./15 keeps one group of at least five operational Panzers, which likely will get through the march, ready starting 25 March 1945, 20:00. Leader: An experienced officer.*
2. *II./15 keeps a similar Panzer-Gruppe ready by 26 March 1945, 20:00 o'clock.*
3. *The Panzers still undergoing maintenance shall be brought along later in groups of at least five Panzers under the leadership of an officer.*
4. ...
5. *The Flakpanzer ... and other damaged Panzers of that kind that cannot be repaired or recovered by the regiment, shall be reported to the regiment, Abt. V, to be recovered by the Armee. Abt. V organizes the necessary means.*
6. *After handing over the rest of damaged Panzers to the Wkst.*

Kp., the I-Staffel I./15 moves as a whole as fast as possible into the new area.

7. *The Wkst.Kp. first keeps working in the existing area. It is within their responsibility that, dependent on the available fuel, all broken-down Panzer of the regiment are recovered. Priority must be given to Panzers lying close to the enemy.*

I- Dienste:

1. *To take care of the moving Pz.-Gruppen, I-Dienste from the Abteilung need to be attached, which can repair minor damage immediately. Additionally,*
2. *A maintenance base will be established at Lindenholzhsn., 3km southwest of Limburg. Leader of the base: Oberfeldwebel Kopka. Contributing to the base are:*
   - I./15: one strong I- Gruppe and 1 radio station;
   - II./15: one fully equipped medic;
   - Wkst.Kp.: one recovery vehicle as soon as possible.
   Oberfeldwebel. Kopka will constantly update the regiment about the parts of the regiment passing by, noting the strength, leader, time and the armored vehicles broken down so far. The base remains in Lindenholzhausen until called by the regiment. When more I-Dienste are freed, the base will be enlarged so that it can also take care of other broken-down vehicles of the division.
3. *During the march, broken-down vehicles that need to be towed need to be reported to the convoy leader or by the base to the Wkst.Kp. in Mündersbach. The Wkst.Kp. decides where the armored vehicle shall be recovered to.*

This order illustrates how a complex march was actually organized. A marching plan also needed to include stops and breaks to regroup the formation and to check, maintain and supply the vehicles. For example, the Pz.Kpfw. Tiger needed a first stop after 5km, then one stop every 10-15km.

In wartime, especially when the enemy controlled the sky, the marching stops could no longer be ordered by the clock anymore, but were dictated by the available cover against aircraft.

In Winter

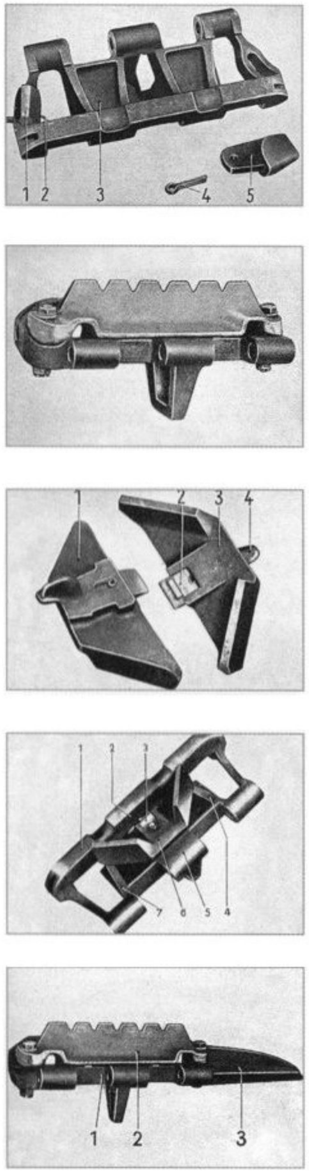
Winter did not change the tactical deployment of the I-Dienste, nor did it favor any warring party. It did, however, bring extra strain on men and machines. In the extreme cold and on frozen ground the tracks broke more easily and driving in low gears strained the engines. Also, springs and axles broke easily because bumps in the hard, frozen ground were difficult to spot under the snow.

Because of the extreme cold, the engines needed to be started at intervals throughout the night. Before starting, they needed to be turned a few times with the starting crank. At temperatures below -20 °C (-4 °F), the engines always had to be heated from the outside. This could be done with warm exhaust fumes from another already running engine, with a blowtorch, or with a fire beneath the Panzer. A report from Panzerregiment 21 from 6 December 1941 stated that:

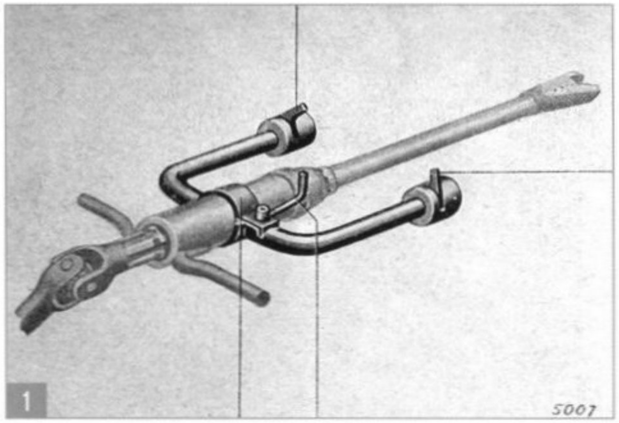
> *... it was necessary to start vehicles at least every two hours. This disturbed the troops' sleep and increased fuel consumption. Assembly areas had to be selected farther to the rear. Thinner oil was needed in the low temperatures. ...*
> *Repairs in low temperatures and snow are extremely difficult. Broken springs and suspension damage of all types occur on hard frozen and packed trails. Recovering broken-down vehicles is more difficult on slick roads. The Zugmaschinen absolutely need snow chains.*

Werner Koscielski, born on 12 May 1924 and sent as Panzer driver and member of the I-Trupp to the SS-Panzergrenadier-Division LAH in spring 1942, remembered in 2007:

> *We did not let the Panzers idle in the night because we were too close to the enemy. To start the other Panzers, we built a construction from pipes to run warm cooling water from one Panzer to another. Further behind the front we let two Panzers idle through the night. It was important to park the Panzers on straw. Otherwise they froze to the ground.*



▲ Various ice cleats. In Feb44, 13.Pz.Div. asked for snow chains for all their vehicles because they "were essential for moving during the mud period."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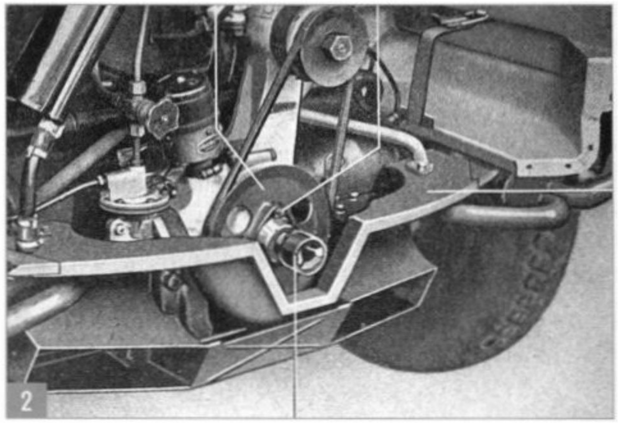
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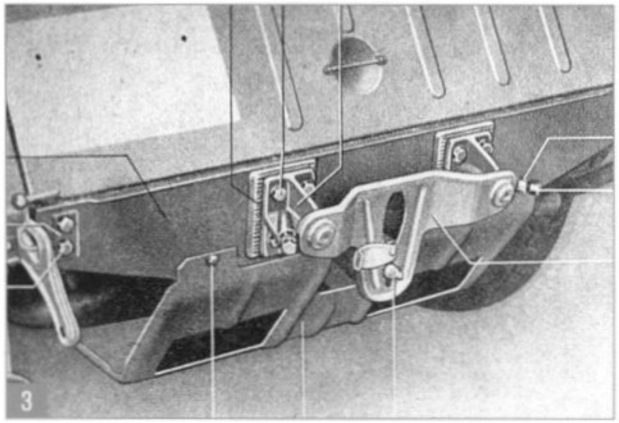
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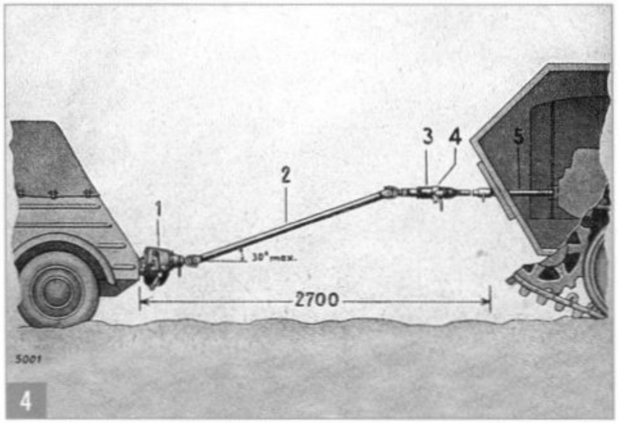
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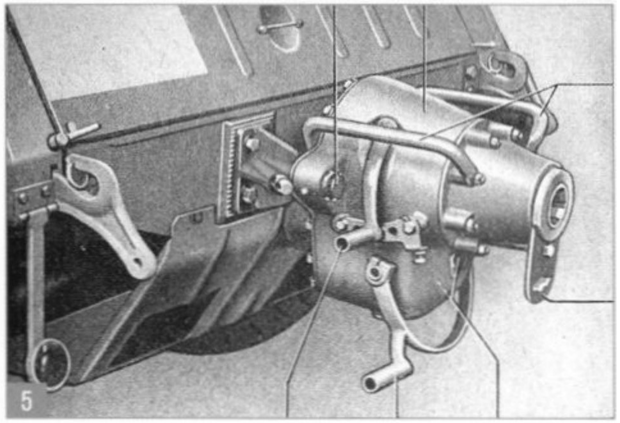
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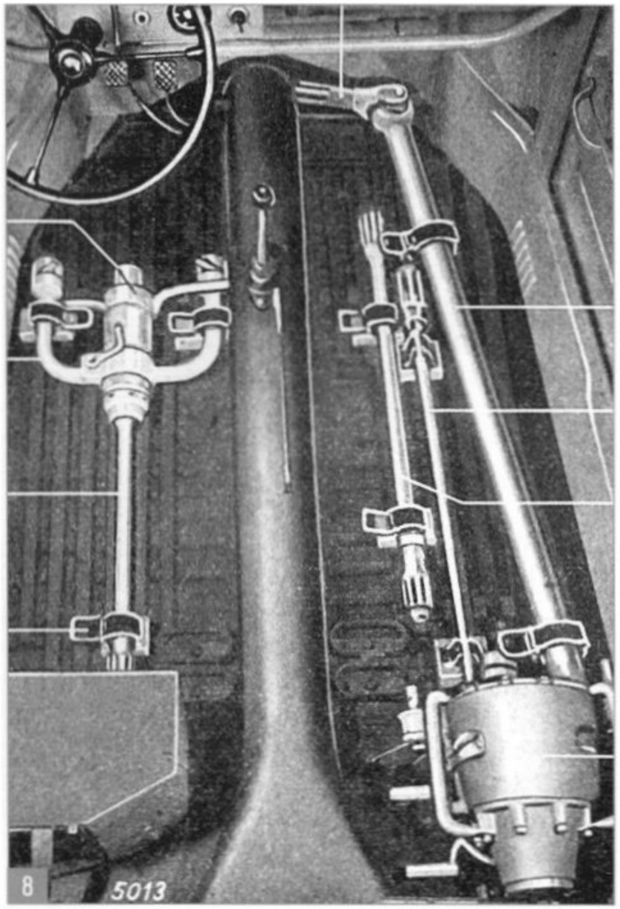
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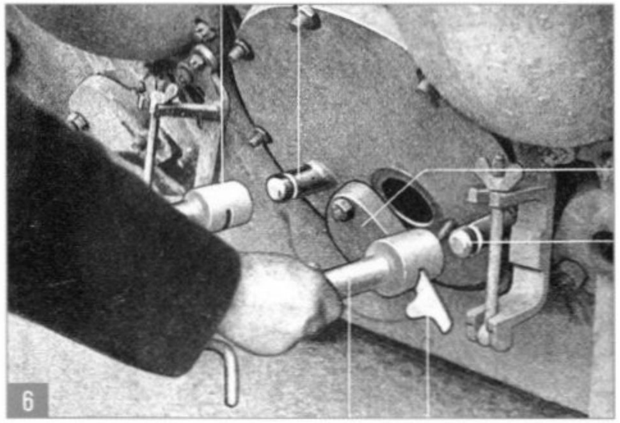
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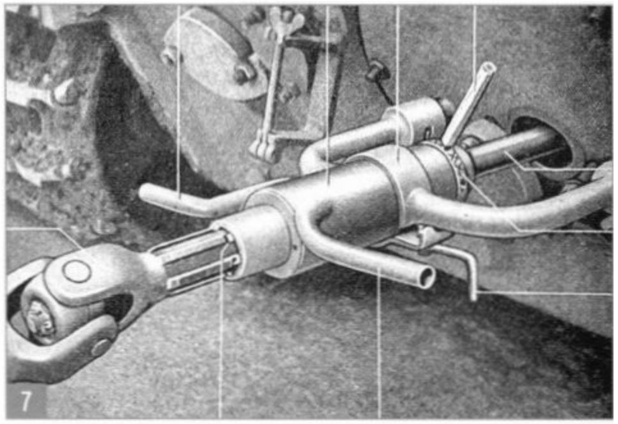
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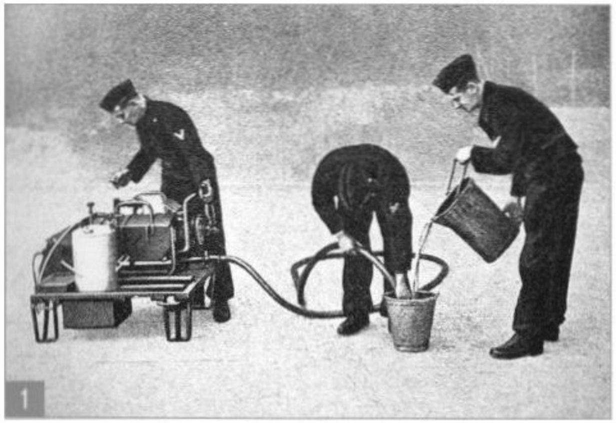
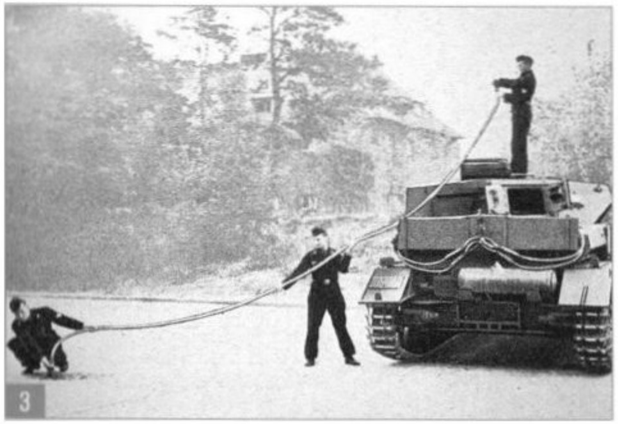
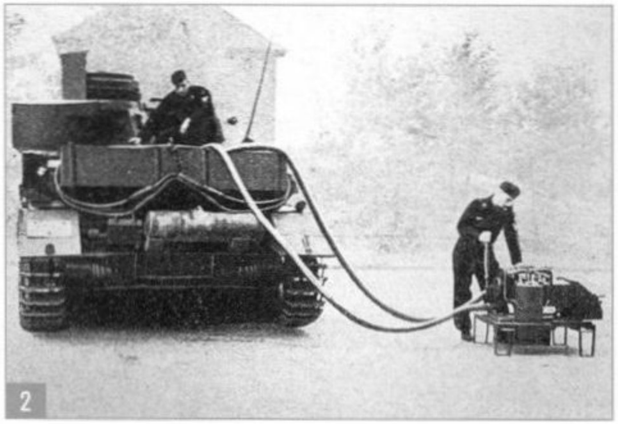
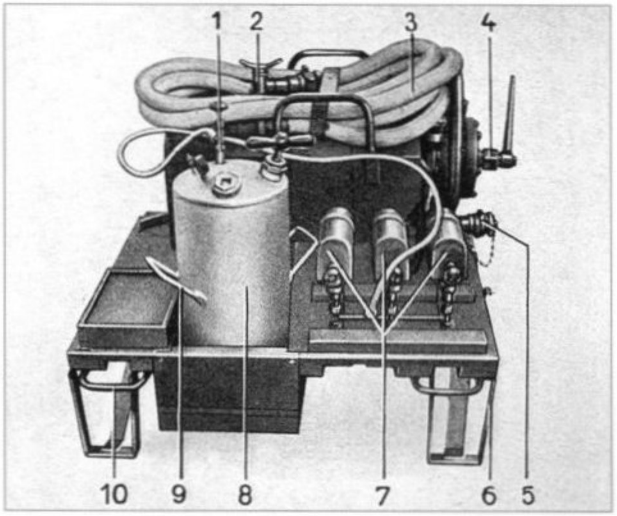




◀ Photographs from a German manual for the 'Anwerfgetriebe am Volkswagen', a cold weather engine cranking device that took its power drive off a modified VW. **1.** Mounting bracket with drive shaft. **2.** Interior arrangement of VW engine compartment. **3.** Bracket for mounting the cranking device bolted in place. **4.** General arrangement of flexible couplings and driveshafts. *(1)* Cranking device, *(2)* Flexible drive shaft, *(3)* Coupling sleeve, *(4)* Guide bridge, *(5)* Crank shaft. **5.** Cranking device mounted on bracket. **6.** Guide bridge being installed over locking bolts on rear plate of Panther. **7.** Flexible drive shaft fitting into coupling sleeve. **8.** Stowage arrangement showing three different drive shafts.

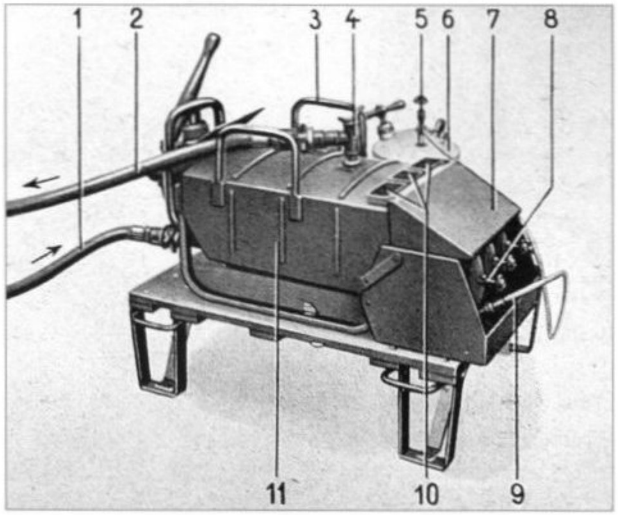


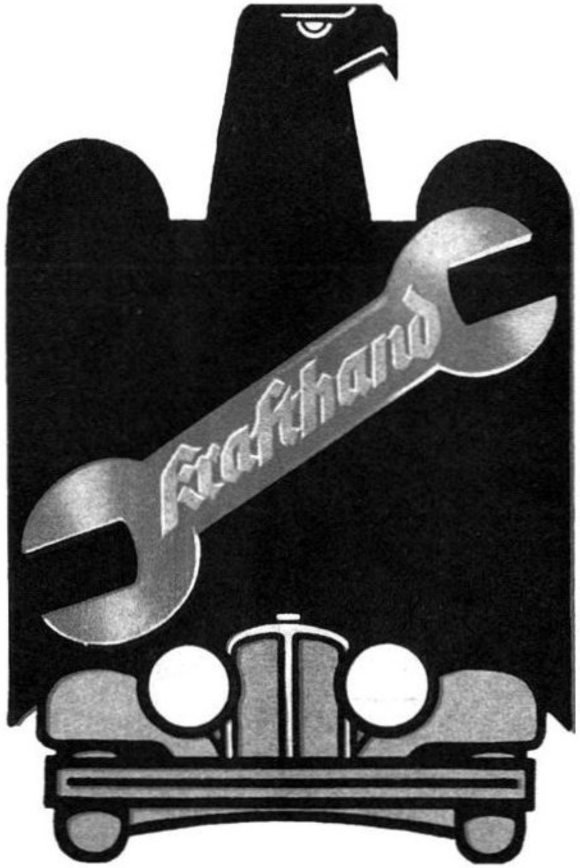
▲ **1.** A 'Pz.Kühlwasserheizgeräet 42' being readied for use. The device could be used as a stand alone device to heat water for a single Panzer or for transferring hot water from one vehicle to another. **2.** One Panzerman operates the device while another keeps an eye on the radiators. **3.** Emptying the hose of fluid. **4.** The hoses could be attached between vehicles directly.

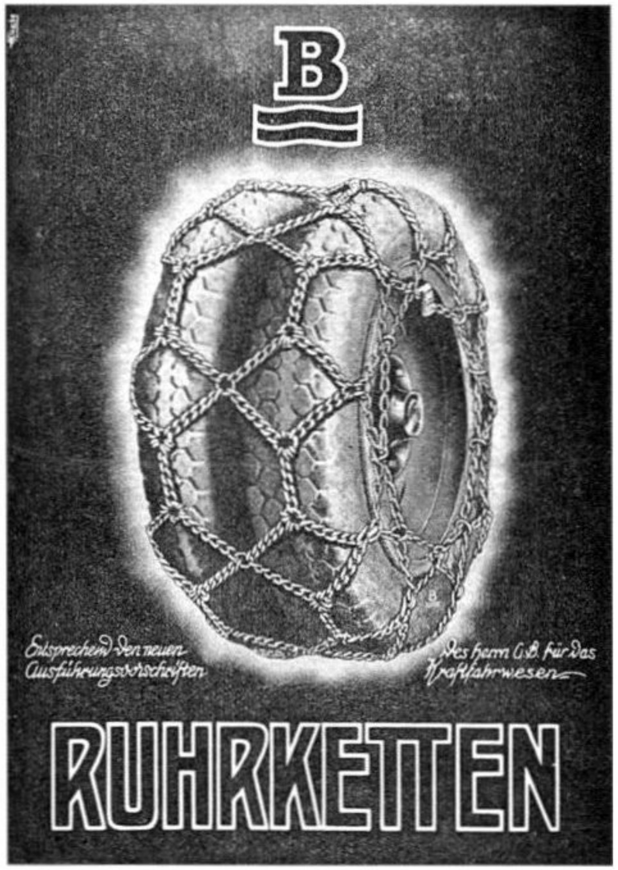


▲ Front view of the 'Pz. Kühlwasserheizgeräte 42' in transport mode. A small gas tank with pressure indicator *(8)* feeds three burners used to heat the water *(7)*. Cooling water enters at the green connection *(5)* and warm water leaves at the red connection *(2)*, propelled by a vane type pump *(4)*.

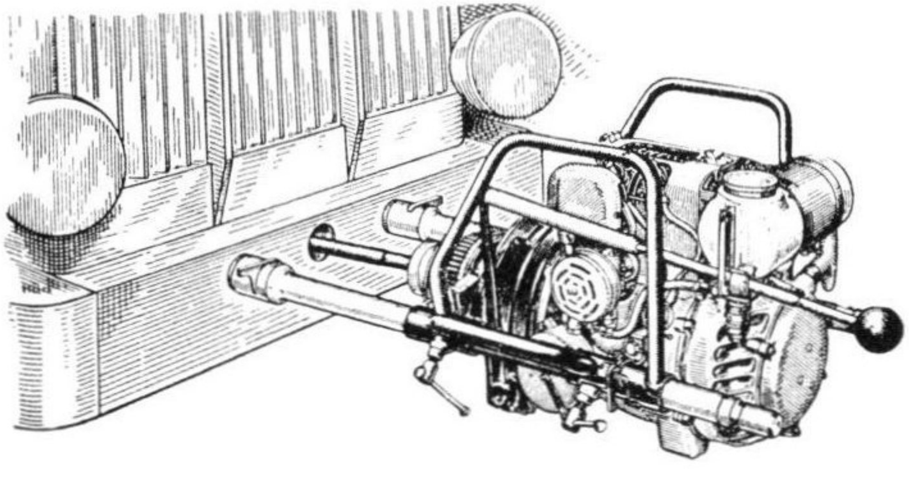
▼ Side view of the device showing the intake hose *(1)* and outflow hose *(2)*. Three flues *(10)* allow gas from the heaters *(8)* to escape. The three heaters are fed by a single gas line *(9)*. Warm water holding tank *(11)*.

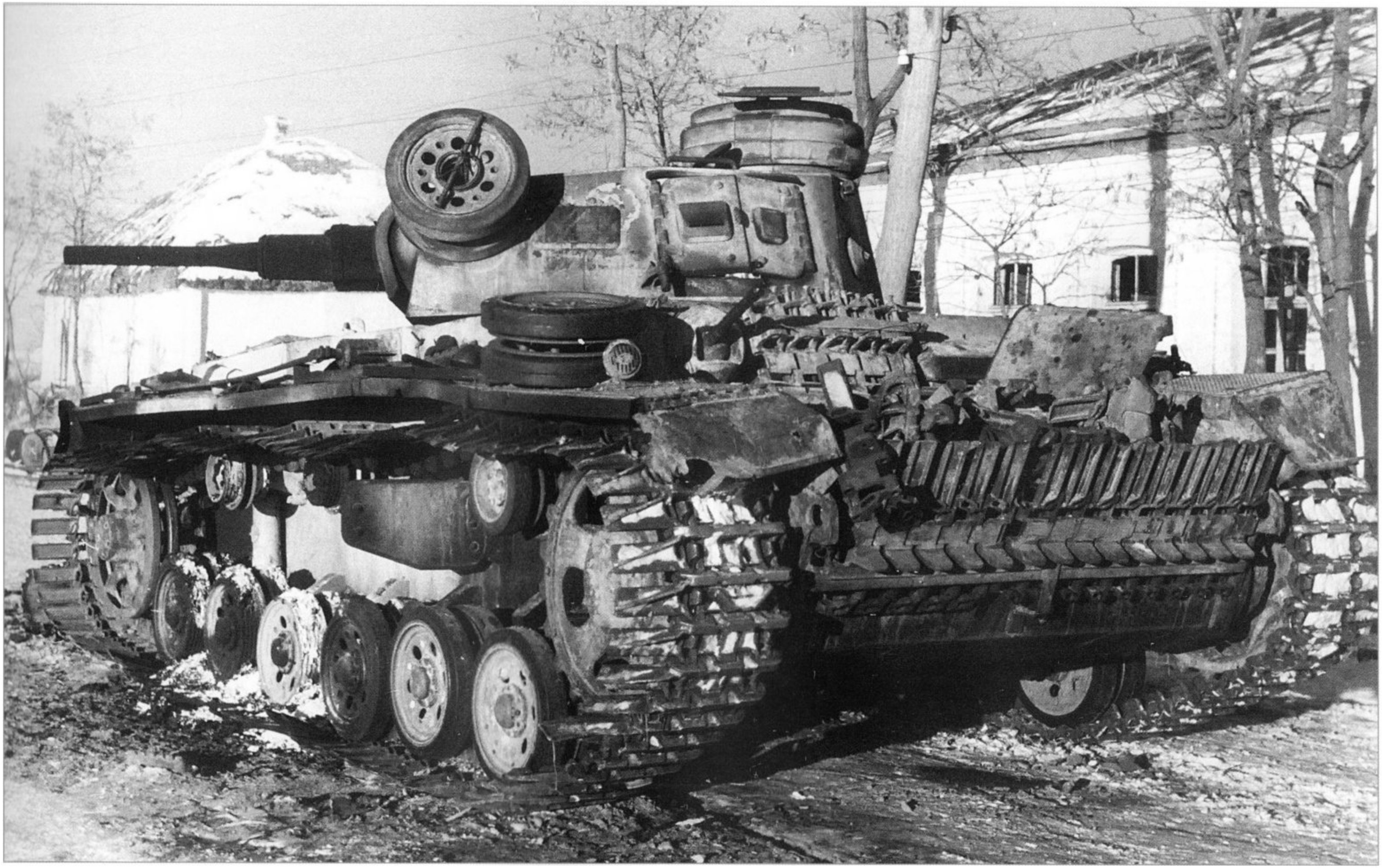





B
Entsprechend den neuen Ausführungsvorschriften
Des herrn G.B. für das Kraftfahrwesen
RUHRKETTEN

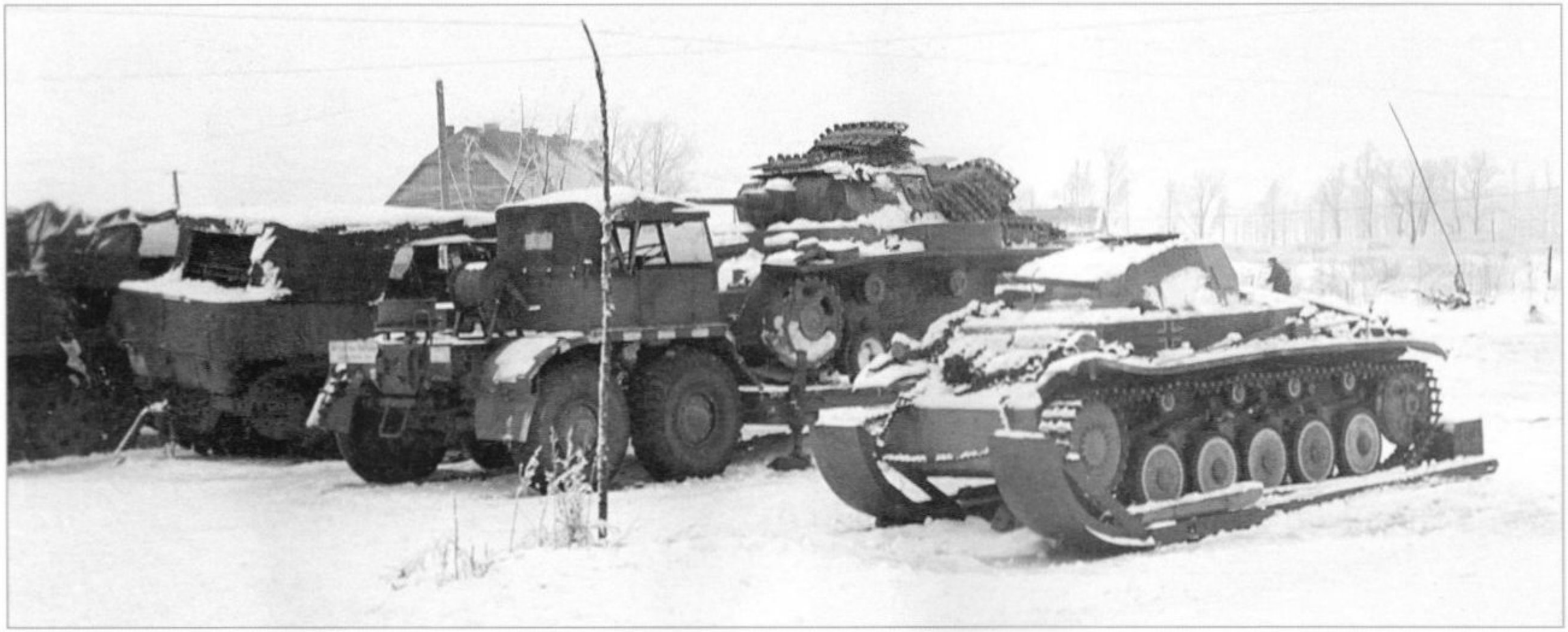
Besides experience and status reports, war diaries and orders, the General Army Bulletin (A.H.M.) and Army Technical Bulletin (H.T.V.B.) were an important source of information. The photos on this page are from an official magazine for all branches of the Kfz. trade named 'Kraftfahrzeughandwerk'. It contained various advertisements, drawings, articles and photos. The picture above shows its logo. *WA*



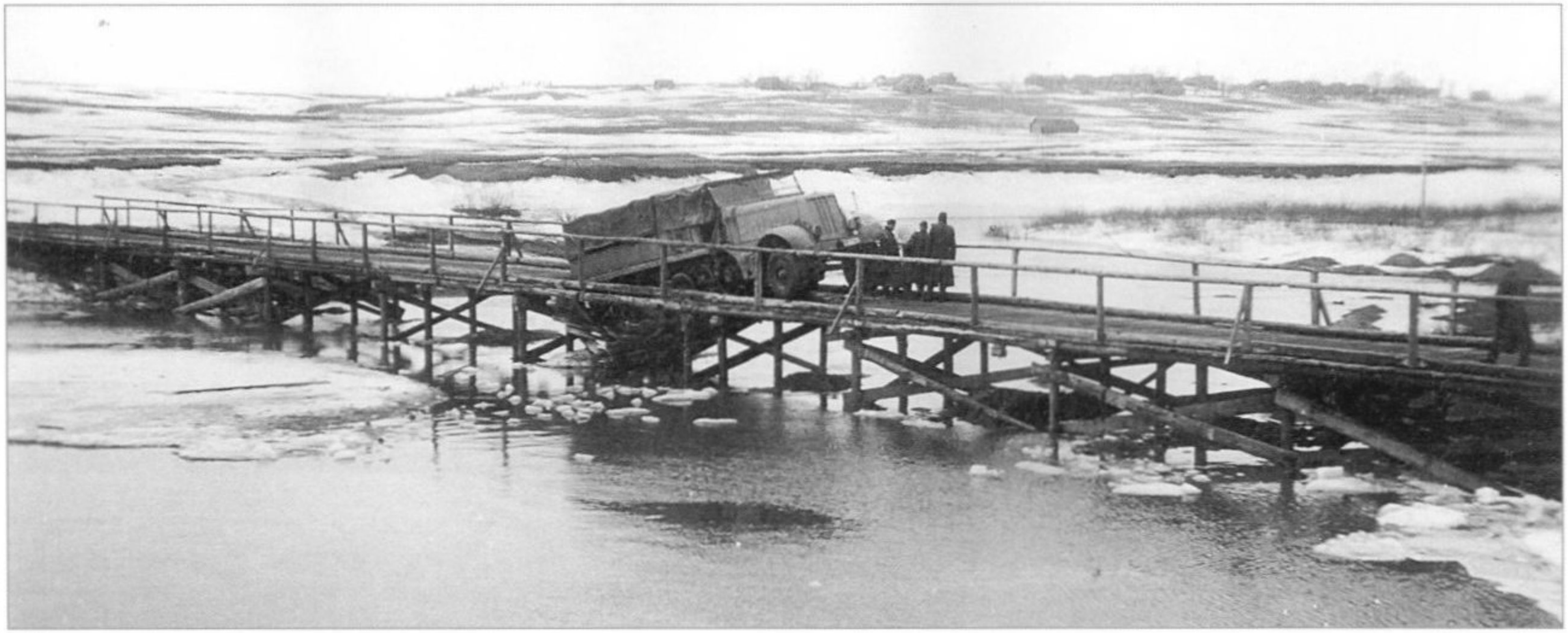


▲ A Pz.Kpfw.III Ausf.J. in Jan43 fitted with 'Winterketten' for improved flotation on snow, which in turn added a lot of weight. 'Mittelstollen' (center cleats) are fitted on top of the tracks to improve traction on ice. *BArch 101I-328-2911-21, photographer: Siedel*

▶ SS-Pz.Gren.Div.2 reported on 14Apr43 that the low-bed trailers could not be used on the narrow routes and deep snow. Here an unknown unit has been creative and put its Pz.Kpfw.II on a sled. *VR*



▶ A Zgkw.18t of an unknown Wkst.Kp. broke through a bridge far away from home. *HE*

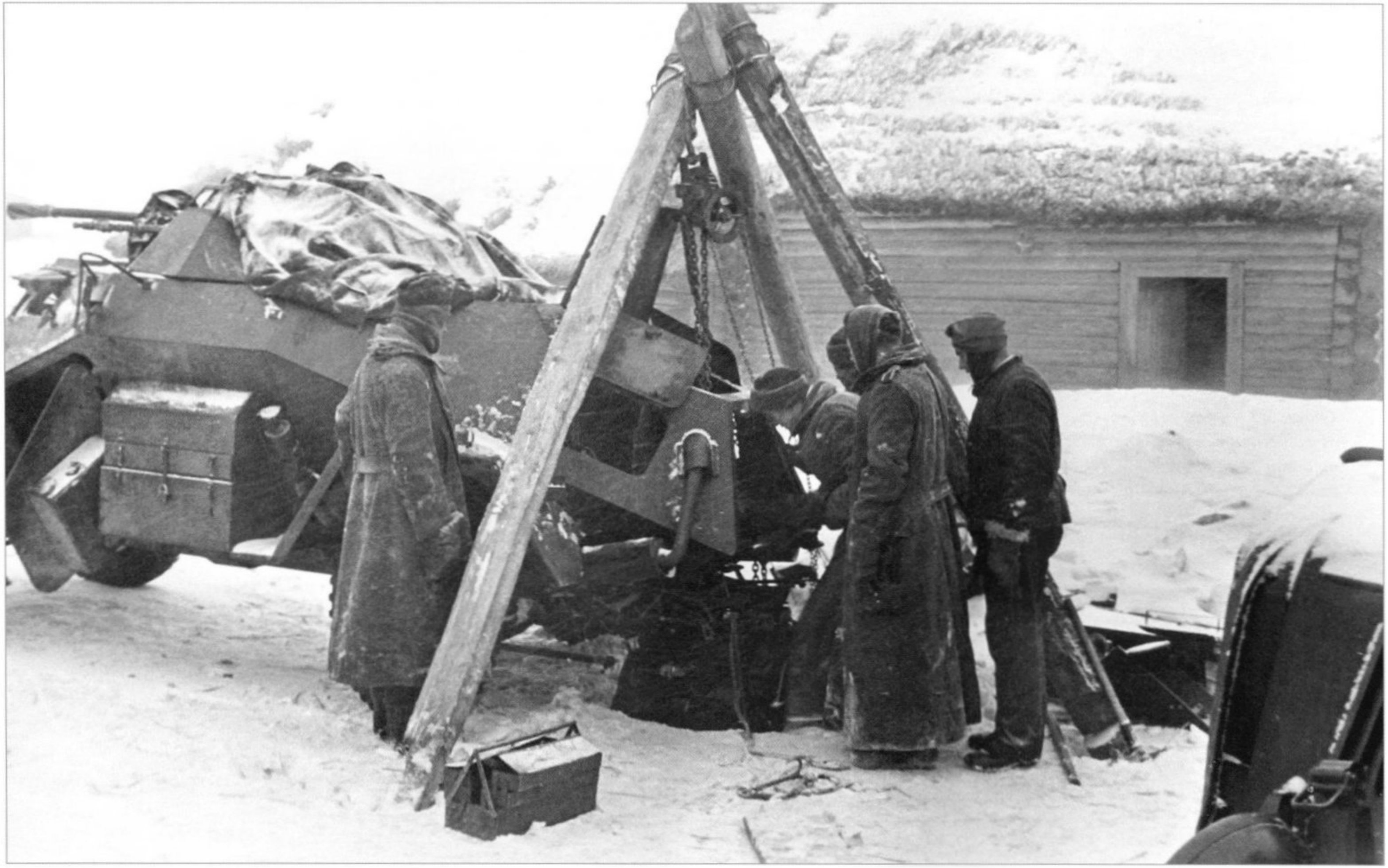


Before switching off the engines in very cold temperatures, they had to idle for a few minutes. Otherwise they risked cracking from the great change in temperature. Snow, mud and ice had to be removed from the tracks, otherwise they broke the next day at the start.

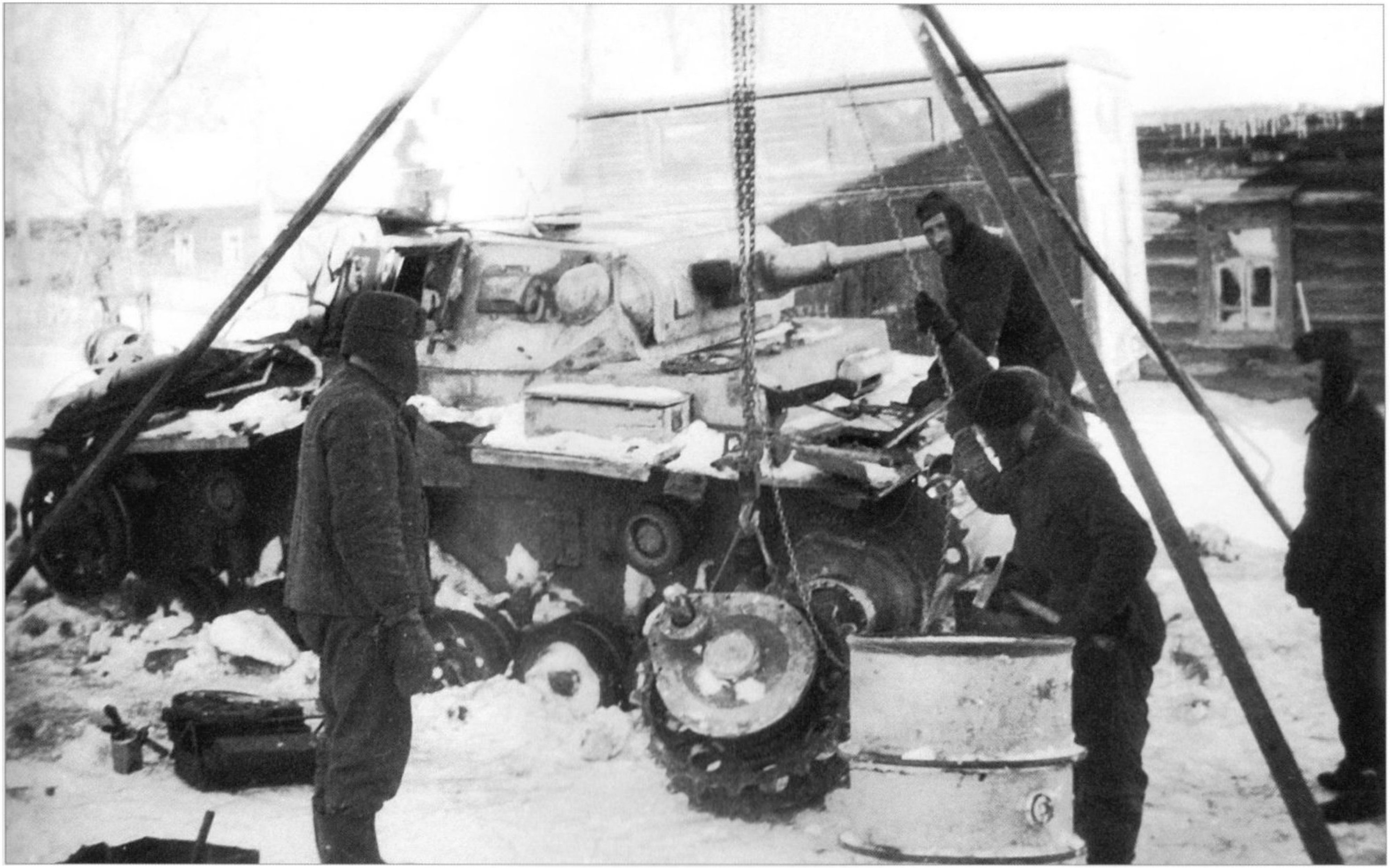
The 'Nachrichtenblatt der Panzertruppen' from September 1943 reported that, in the winter 1942/43, Panzerdivisions were successful by establishing 'Kfz.-Instandsetzungs-Stützpunkte' (maintenance bases). The paper recommended all Panzer-Divisions create such bases in the upcoming winter. For a successful 'winter overhaul undertaking', the paper gave the following relevant information:

1. *Task: Thoroughly overhaul all Kfz. of the division in need of maintenance.*
2. *Choice of Location:*
   a) Far enough behind the front so that the work is not hindered by enemy action,
   b) Close to a H.K.P., central spare part depot and I-Dienste of the Armee,
   c) Short marching distance from the divisional units to the maintenance base,
   d) Availability of heatable working halls,
   e) Possibility of camouflage.
3. *Strength of the divisional I-Dienste at the base:*
   a) Two Div.Wkst.Kp.,
   b) An I-Staffel of each Rgt.,
   c) A strengthened I-Gruppe of each independent Abt.
4. *Approximate need for hall space:*
   a) ca. 1,000m^2. for each Wkst.Kp.,
   b) ca. 600m^2. for each I-Staffel,
   c) ca. 400m^2. for each I-Gruppe.
5. *Technical task of the maintenance base:*
   a) Acceptance of Kfz. in repair which cannot be handled by the mobile workshop companies in the area of operation.
   b) Distribution of those vehicles among the I-Dienste on the base and decision if vehicles must be forwarded to 'rückwärtige I-Dienste' such as H.K.P., Inst.Kpn. etc., or homeland maintenance.
   c) Control of engine exchange.
   d) Procurement of spare parts, Kfz. accessories, tools and other vehicle equipment (K-Gerät), complete the workshop equipment.
   e) Acceptance of vehicles coming back from repair.
   f) Train drivers, driving instructors, further training of mechanics and Werkmeister. Teach clerks to become auxiliary W.K.S.
6. *Only give most difficult repair to the I-Dienste of the Armee.*
7. *Beginning of the maintenance undertaking: Beginning of October.*
8. *As an example, a Pz.Div. overhauled the following numbers during a maintenance period thanks to the creation of a maintenance base:*
9. *450 motor cycles, 380 Pkw., 1,240 Lkw., 60 Zgkw. and 60 Sd.Kfz.*

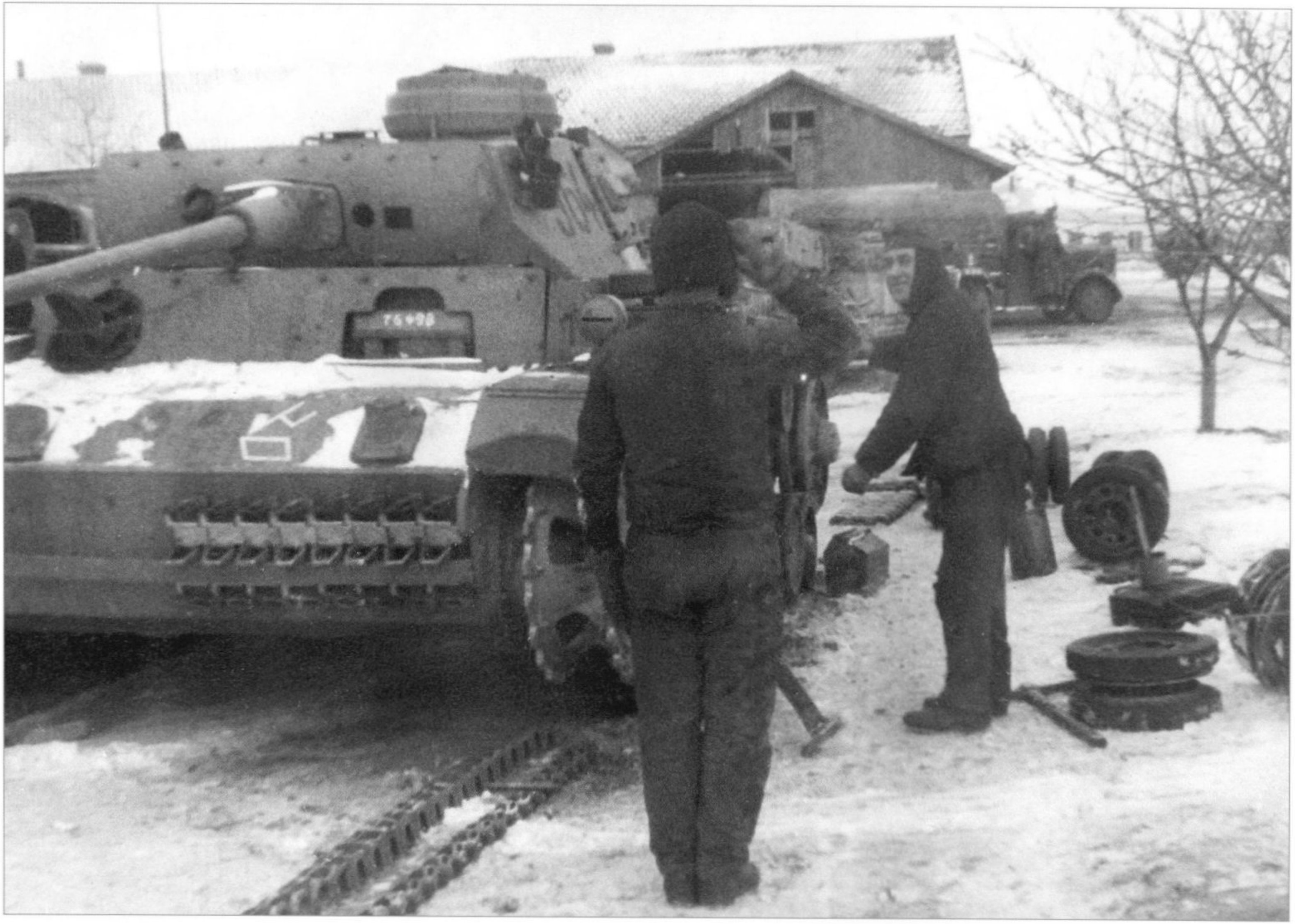
▼ Improvising was a virtue of the maintenance troops, demonstrated here on a leichte Zgkw.1t (Sd.Kfz.10). *AMC*

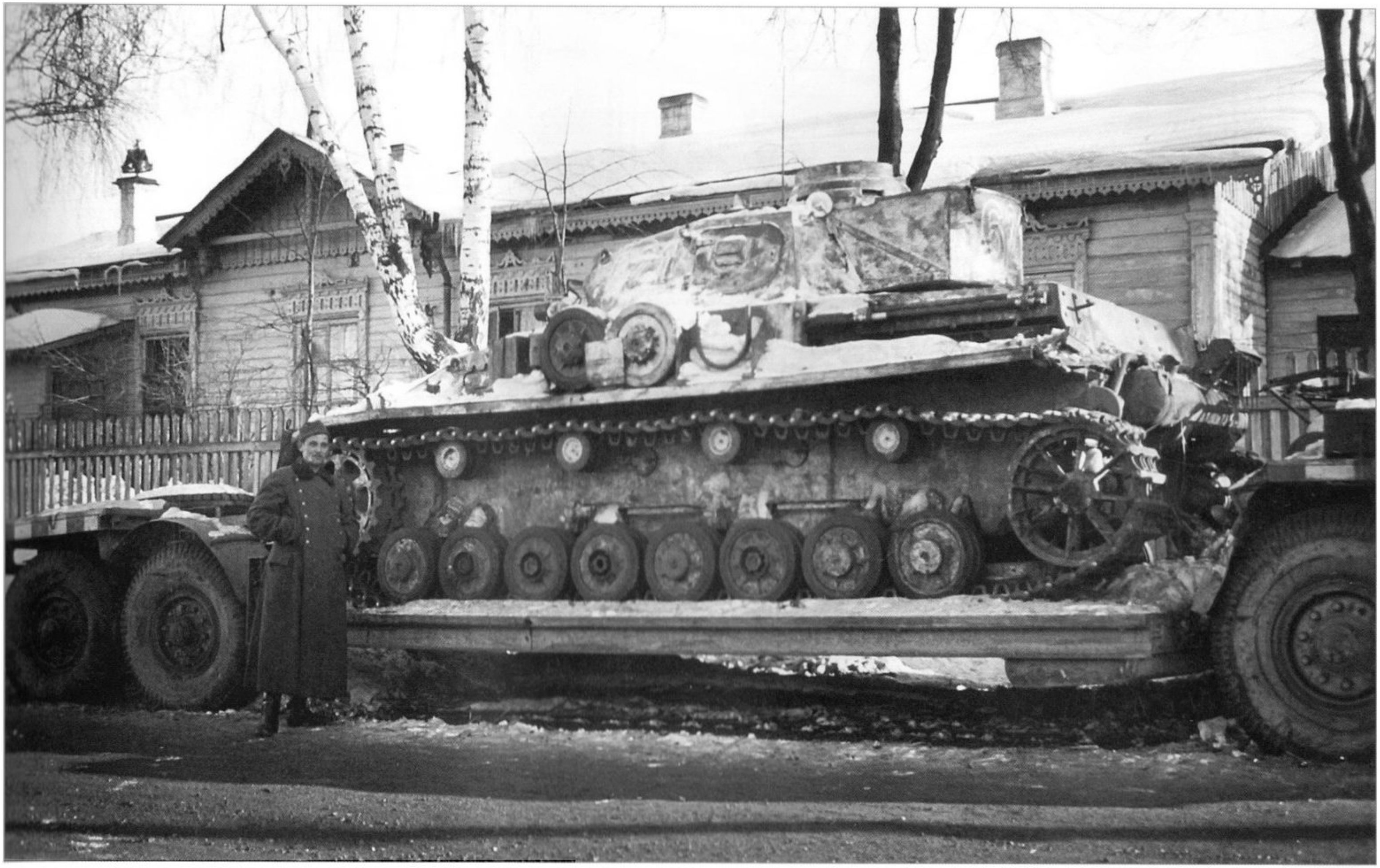


▲ A le. Panzerspähwagen (2cm) (Sd.Kfz.222) from 11.Pz.Div. gets a little attention in the frozen wastes of the Eastern front. The fresh snow implies that it was snowing when the picture was taken. A tarp is used to cover the open topped turret. *AMC*



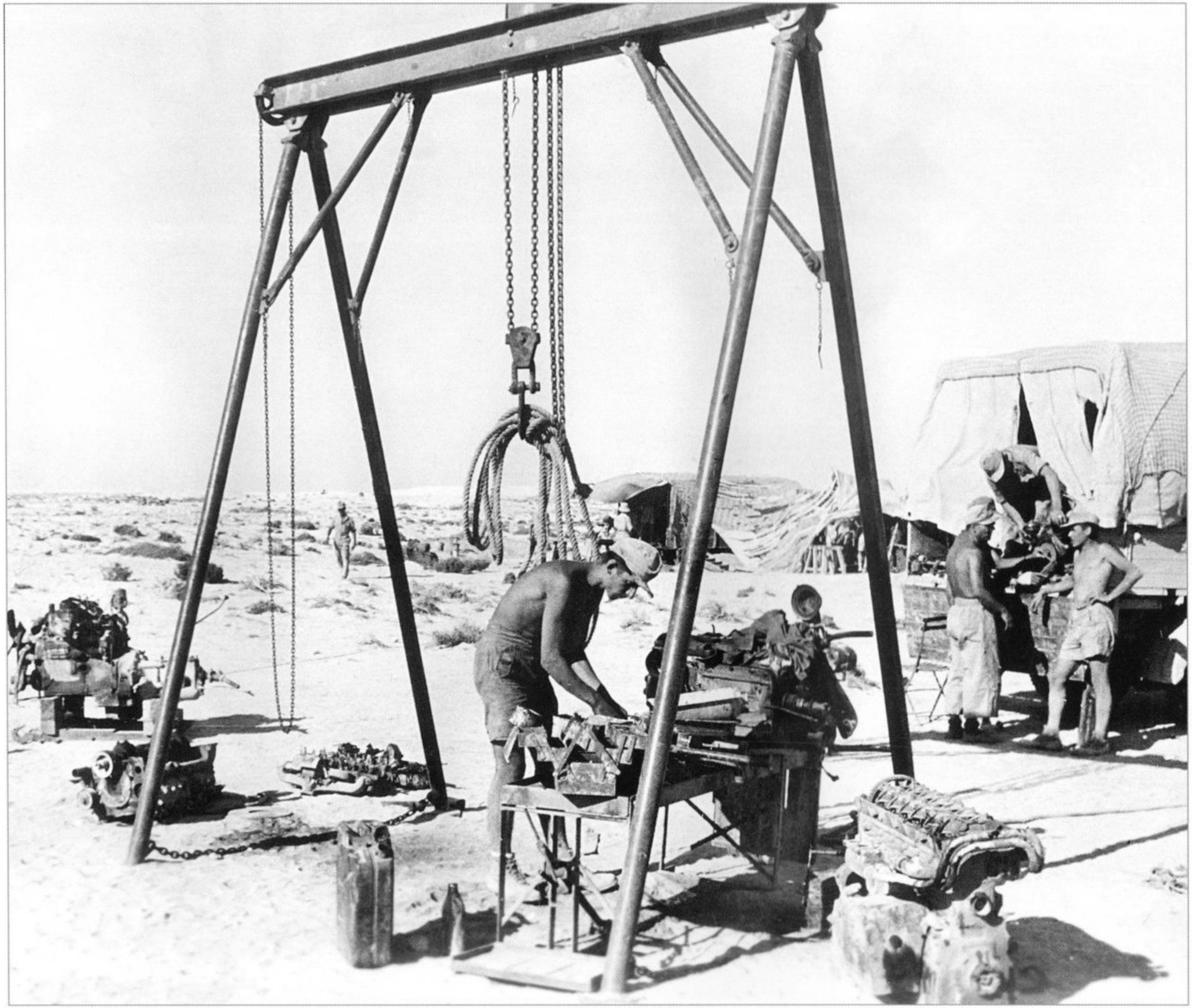
▲ According to the back of the photo, the work on this Pz.Kpfw.III Ausf.J was undertaken at -47°C. It is impressive how these machines could be made ready again under such working conditions as depicted above. *AMC*





◀ Worn down road wheels are being replaced. The chassis number '76493' on the driver's vision port identifies this tank as a Pz.Kpfw.III Ausf.M assembled by Miag between October and December 1942. *AMC*

▲ A Pz.Kpfw.IV Ausf.D on a Sd.Ah.116 in the winter of 1941/42. The Panzer is numbered '621' and belonged to Pz.Rgt.27, 19.Pz.Div. Note the extra brackets for spare track links on the side of the hull and the extra mount for spare road wheels. *AMC*



▶ A workshop company works 'al fresco' in the desert. The photo was taken by correspondent Otto (Sch) and dated 25 July 1942. *VR*

In the Desert

Like extreme cold, the rough climate of North Africa brought new challenges to the Panzers and the I-Dienste. For the first time, Panzer maintenance had to be carried out without the infrastructure that could be found in Europe. Water, electricity, shelters - *everything* - had to be brought in, because what you did not bring was not there. The great distances required a lot of fuel and wore down the vehicles. The suspensions were further battered by the hard ground; due to tactical reasons the vehicles were often driven cross country instead of following the roads. The sand led to higher oil consumption and, as opposed to Europe, water had to be carried everywhere. More than anywhere else, the battle in the desert was decided by logistics. There were few available ports, and nothing was made easier by the lack of a railroad .

A good month after the first German Panzer operation, on 5 May 1941, General Franz Halder noted:

> *Gen.Qu.: Kfz.-situation Libya: In 3 weeks circa 250 French Lkw and in 12 weeks circa 1,500 Lkw can be expected. The 15. Panzerdivision will have difficulties with spare parts because of their many different vehicle types. Maintenance possibilities in Libya are very limited. A 'tropenfähiger' Kraftfahrzeugpark will be formed by the end of June which can be operational in Benghasi at the beginning of July.*

On the next day he noted:

> *Gen.Qu.: Spare parts requests are only fulfilled to 10-15%. A spare parts depot needs to be installed in Benghazi. The supply units are hard to command due to the extraordinarily long distances.*

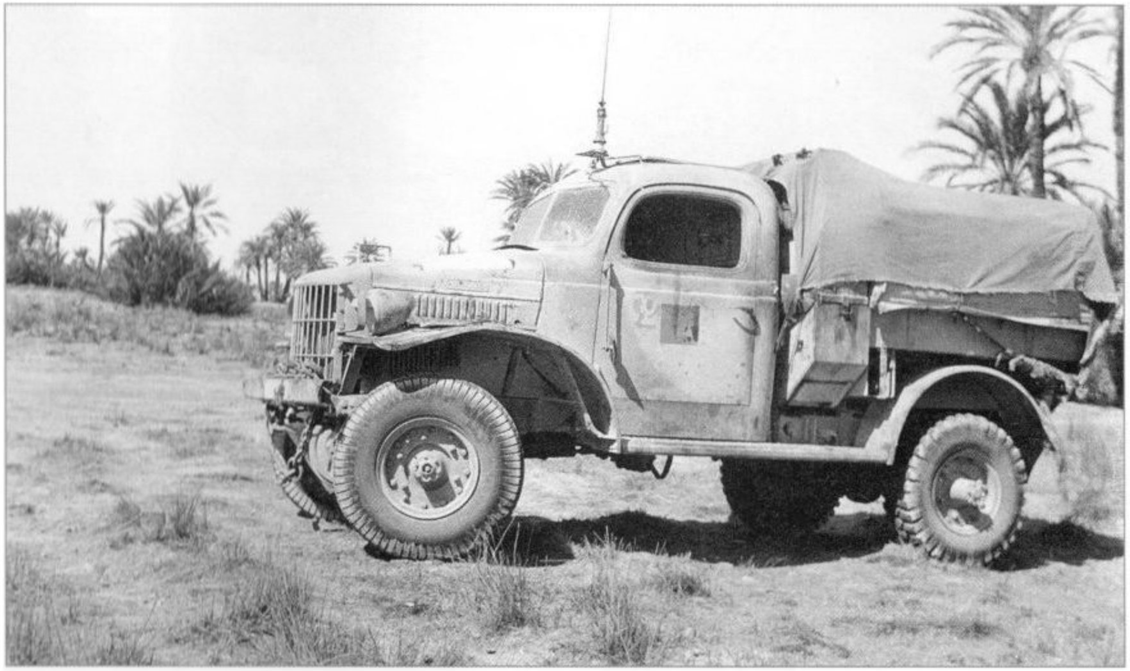
The situation was diffused by the many vehicles the German troops could capture. Broken-down Panzers were cannibalized and thus served as spare part depots for the operational Panzers. Some of these broken-down Panzers were still around when the Germans had to retreat after the battle of El Alamein and were salvaged further for spare parts. Broken-down Panzers had to be found by compass and grid square.

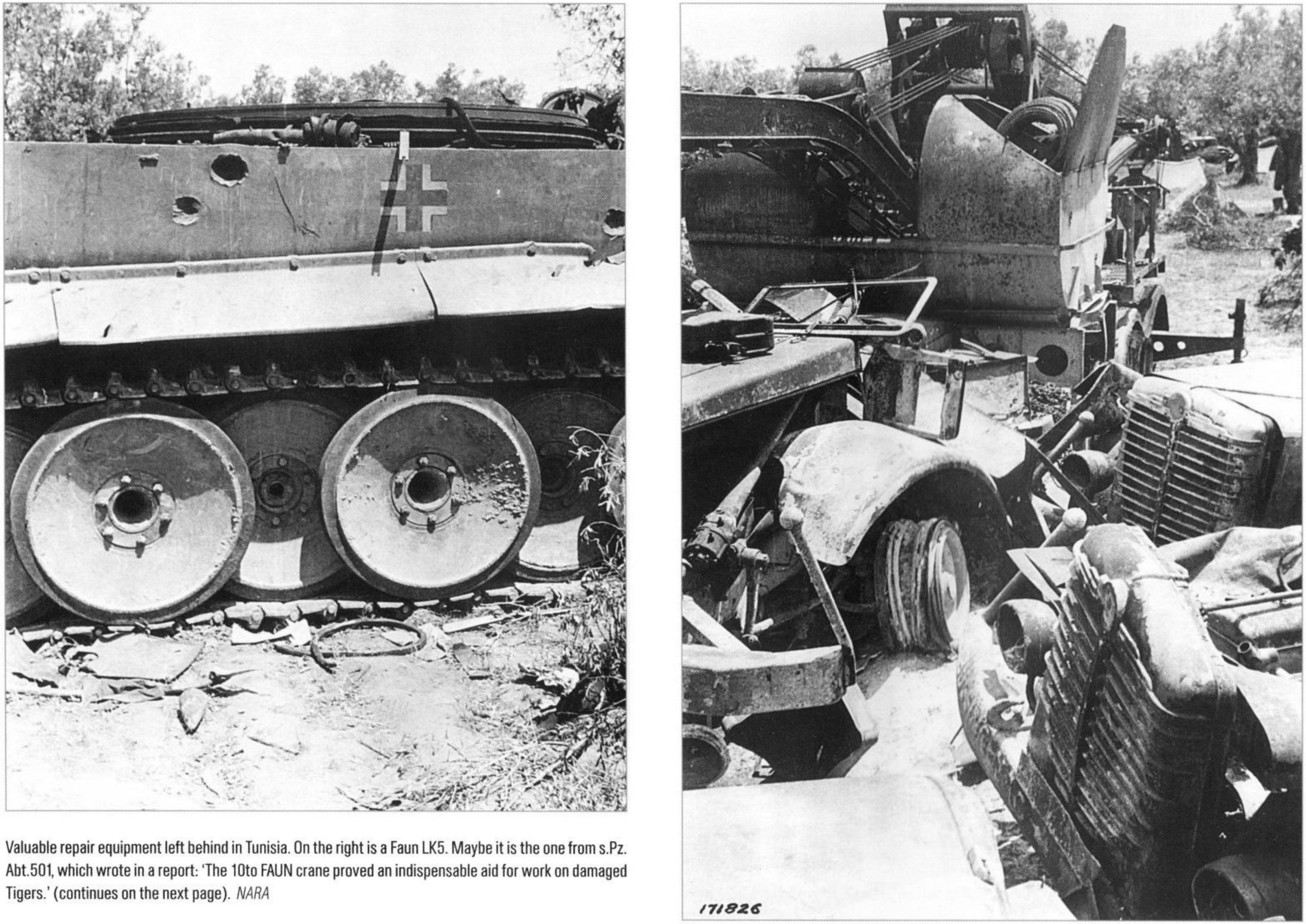
Retreating from the African continent, the Kraftfahr-Parktruppen within H.Gr. Afrika lost the following units:

Kfz.Inst.Kp. 215 and 134, Pz.Berge Kp. Afrika, Nachschu Stab f.Kfz. Ers.Tle.3, Reifen Staffel 573, Pz.Sp.Ers.Teillager, Pz.Ers.Teillager G (the rest joined Kf.Kp.1151), V.W.Zug, Bosch-Zug, Pz.Ers.Teil-und Reifenlager 210, Kfz.Park 689 (without J-Staffel), Heer.Kf.Park 560 with 3 Wkst.Zg., Heer.Kf.Park 566 with 3 Wkst.Zg., Pz.Ers.Teillager OKH/E.

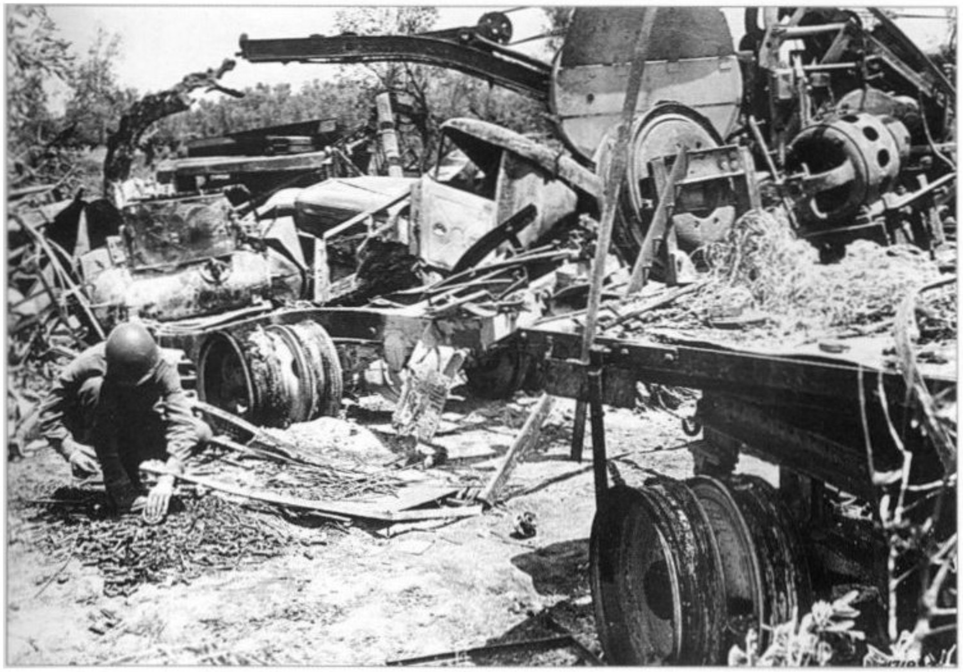
The surviving units as of 12 May 1943 were Stb.Kfz.Inst.Abt. 548, Reifenstaffel 404, Reifenstaffel 581, J-Staffel aus AKP 689.

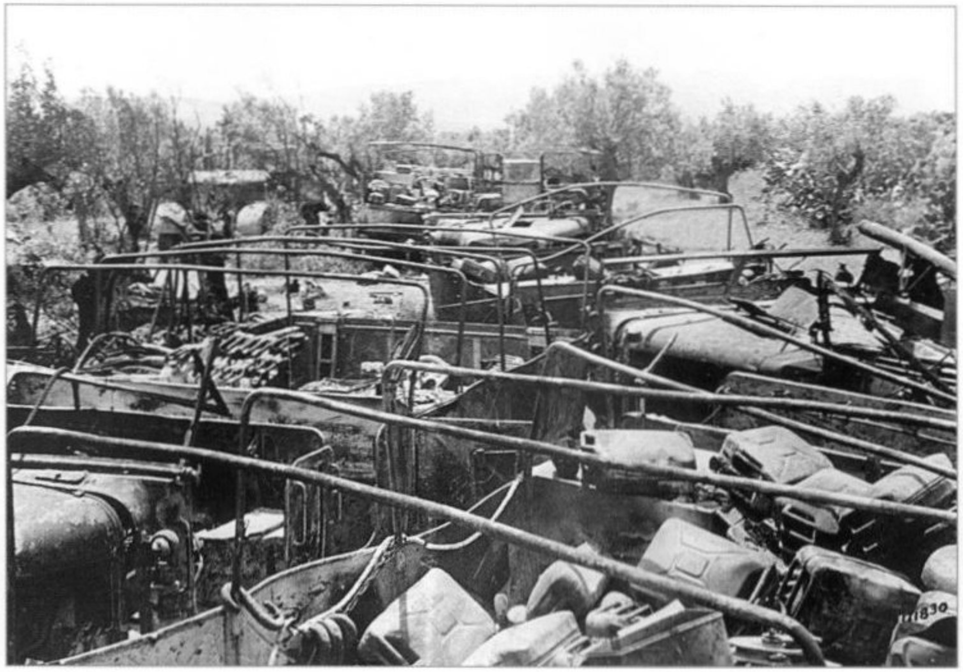
▼ This is a Dodge T212/D8A captured by a German unit and pressed into service in Africa. *HE*

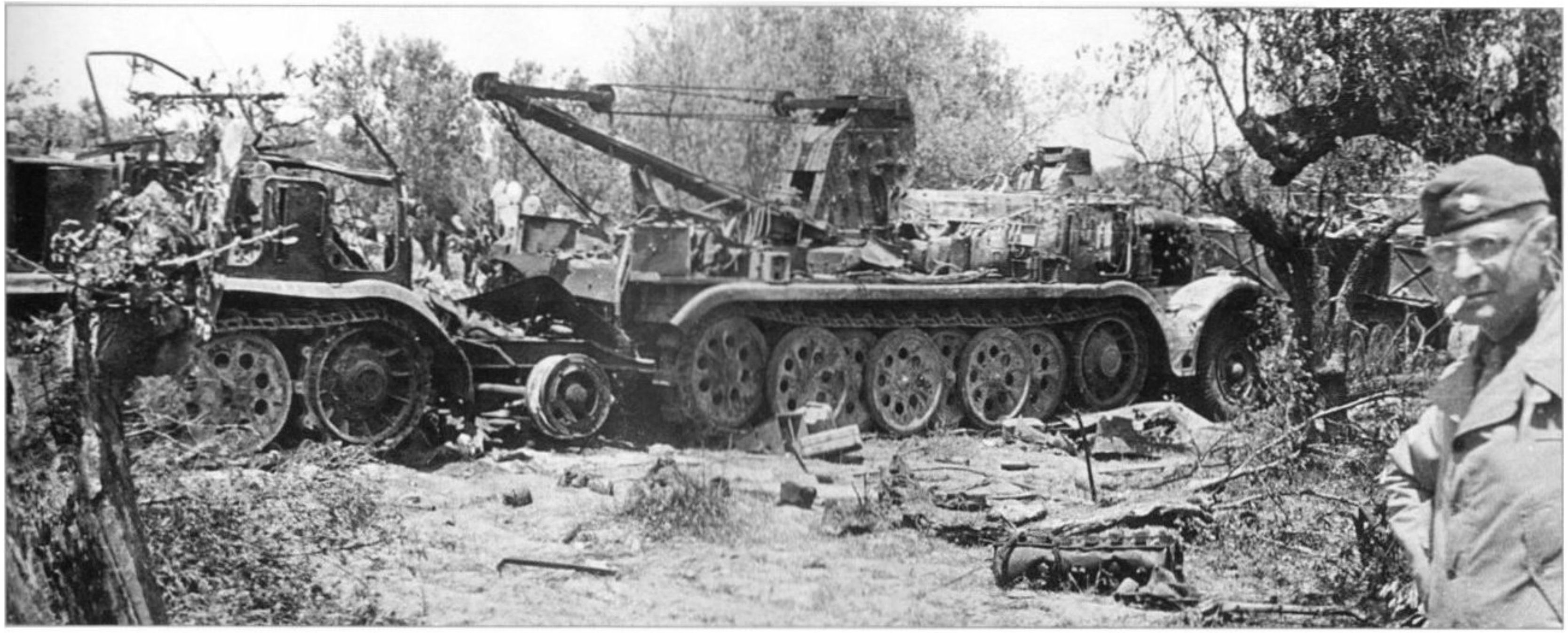




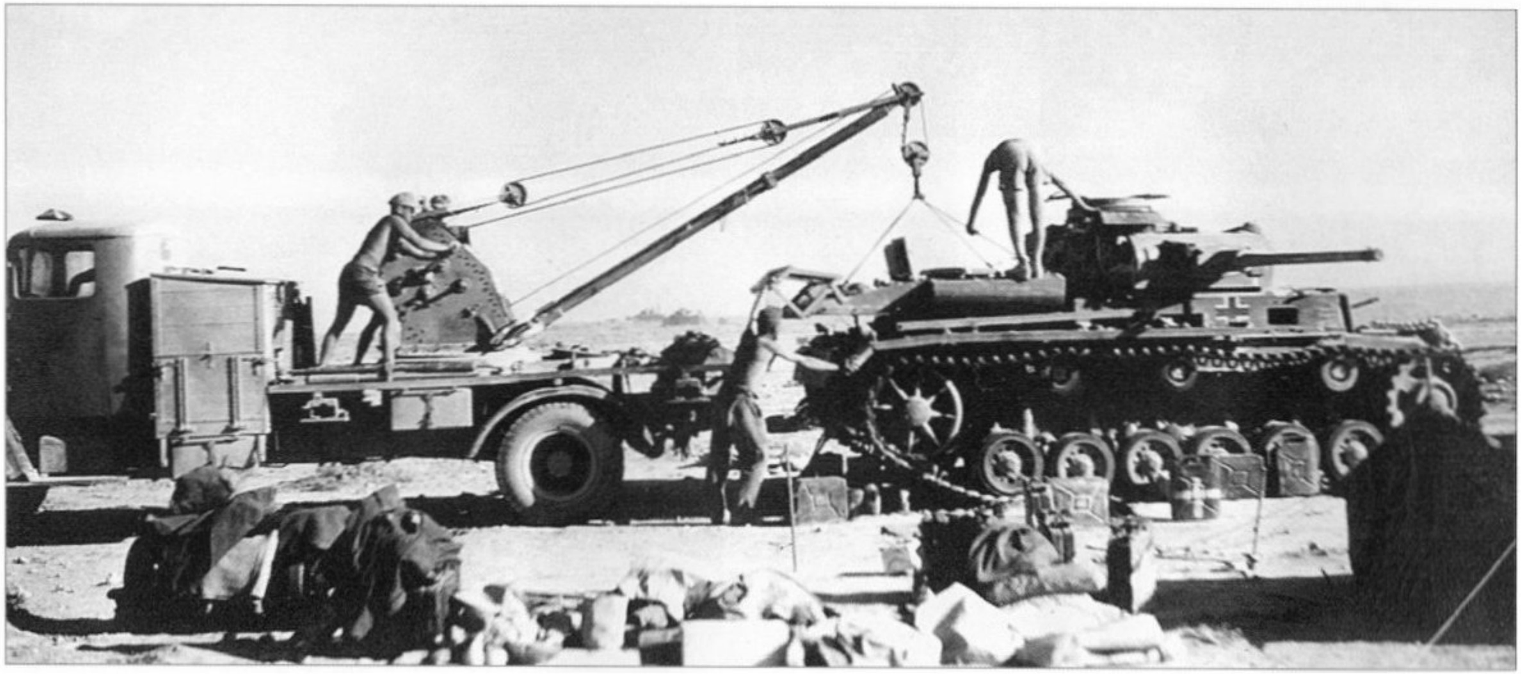
Valuable repair equipment left behind in Tunisia. On the right is a Faun LK5. Maybe it is the one from s.Pz. Abt.501, which wrote in a report: 'The 10to FAUN crane proved an indispensable aid for work on damaged Tigers.' (continues on the next page). *NARA*





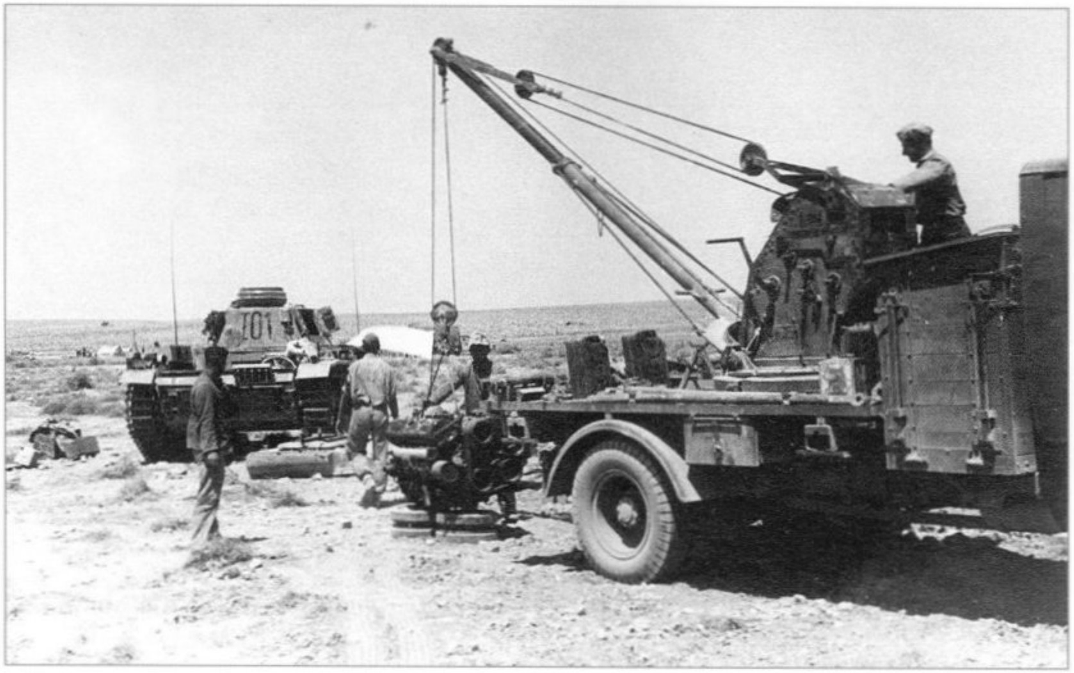


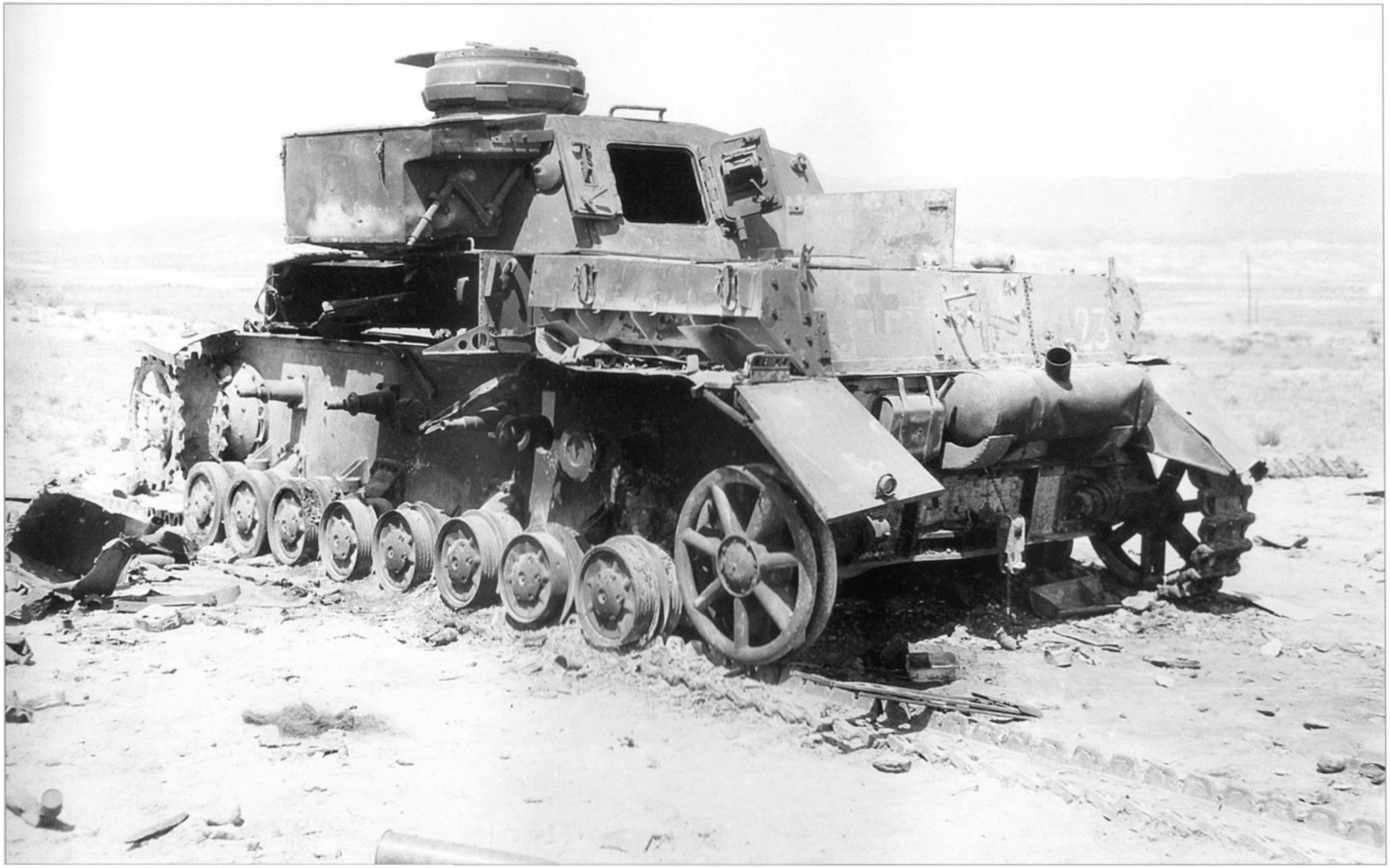
"On dry land it can be driven everywhere. Its steering is very sensitive and it must therefore in particularly difficult areas be towed to the site of the Tiger by a Zgkw. This crane is the only means by which the turret of a Tiger can be removed when the 15t gantry crane cannot be used due to ground conditions." The photos were taken by Lt. Ziegler, in the olive groves between Bizerte and Tunis, near the town of Porte Narina on 21 May 1943. The vehicles were torched by the Germans who could not recover them due to the fast advancing Allies. *NARA*



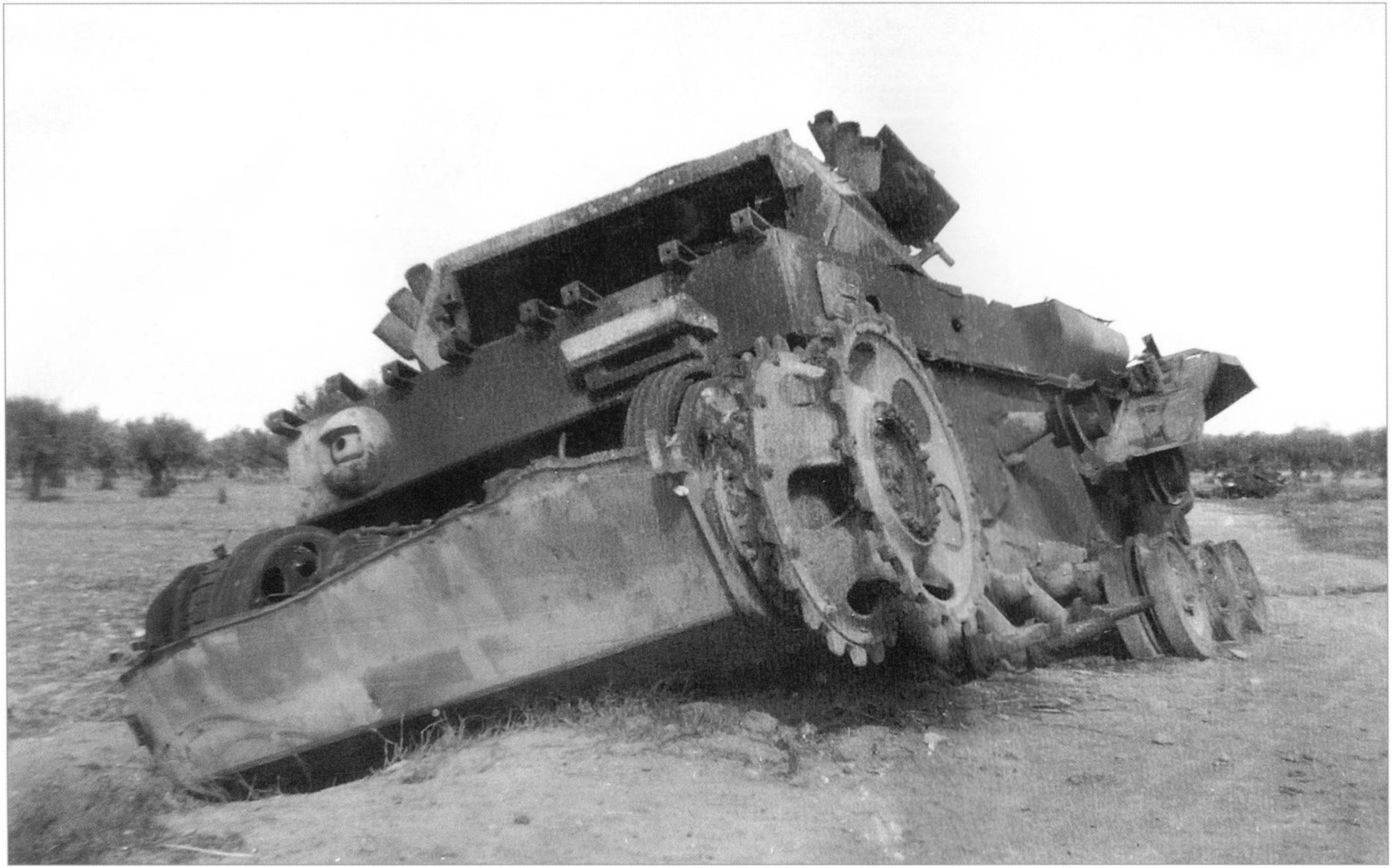
◀ The I-Staffel removes an engine from a Pz.Kpfw.III of Pz.Rgt.5. *BH*

▼ Probably not the same scene, but a Drehkran (Hebekraft 3t) auf Fahrgestell des Lkw 4,5t (gl.) (Kfz.100) is used to remove the engine deck of a Pz.Kpfw.III. *AMC*





▲ '823' was a Pz.Kpfw.IV Ausf.G from 10.Pz.Div. Note the starter crank mounted on the side of the turret bin, a unique feature on tanks of this unit because they carried a wooden box on the track guard where the crank was normally installed. *AMC*



▲ This Pz.Kpfw.III was left behind in Tabourba, Tunisia in 1943 in a sorry state. It has two shell penetrations in the hull side and the armor on the nose has been cut away. The gun was probably removed to arm another tank *AMC*

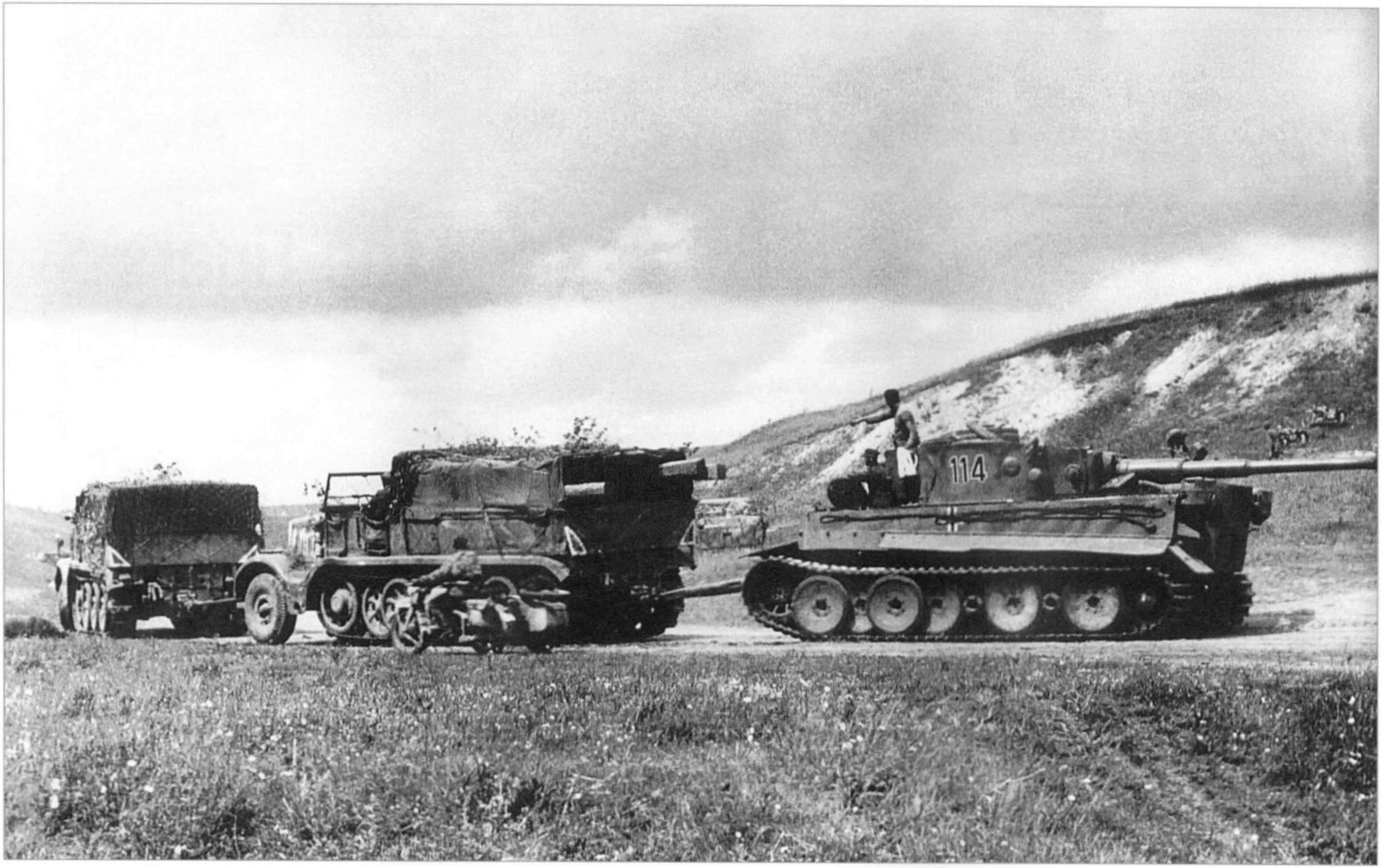
Maintaining the Tigers

2

Tiger '114' - An Introductory Example 39

The Tiger, a Problem Child? 39

A Healthy Child Can Also Break a Leg 55



▲ Tiger '114' is towed by three Zgkw. (the third is not visible here). The gunner, Walter Junge, and the driver, Walter Eschrig, are visible on the tank. The Zgkw. carry the white triangles as they were painted on the vehicles of s.Pz.Abt.503 in 1943. *AR*

Tiger '114' – An Introductory Example

In 2004 Alfred Rubbel told the story of his deployment with his Tiger '114' during operation 'Zitadelle':

> *Our Tiger was shot in the morning of 7 July during an attack on Shliakhovo. I do not know who got us, but since neither the T-34 nor the US Sherman had such a powerful gun, it must have been an anti-tank or field gun. The damage was a destroyed left final drive which, because of its size, could not fit inside the hull and was thus only lightly armored, as well as a hit on the 100mm thick front armor plate. The hit on the left sprocket and final drive immobilized the Tiger. The hit on the front plate did not penetrate but its kinetic energy left a deep dent in the armor and burst the welding seams open so that the sunlight came through.*
>
> *Because the fighting was over a great distance and the attack was gaining ground, we could unhurriedly prepare the recovery. The company commander was informed by radio about the damage, condition and position of the vehicle. We were ordered to stay with the vehicle, secure it [defend against infantry] and wait for the recovery platoon. The sprockets had to be separated from the drive train. This was no problem on the right side but it was impossible on the damaged left side.*
>
> *About two hours later three Zugkraftwagen arrived and towed us to the rear. After approximately 6 miles, a Werkmeister took a look at the damage and decided to tow us to the planned next forward position for the Werkstattkompanie. There it was determined that the damage on the armor was so severe that the Tiger needed to be shipped to the homeland. Hereupon we unloaded our personal items, weapons and ammunition. The fuel tank was pumped almost empty. Our crew went to the wheeled parts of the Abteilung, where we waited four weeks for a new Tiger.*

The Tiger, a Problem Child?

That Tiger maintenance is portrayed in a separate chapter should not lead to the conclusion that the Tiger was less reliable than other Panzers. A comparison chart put together by Thomas L. Jentz shows that the percentage of operational Tigers was the same as the one for the Pz.Kpfw.IV and equal or even superior to the Panther.

Average of operational Panzers 31/05/44 - 15/03/45

Eastern Front			Western Front		
Pz.Kpfw.IV	Panther	Tiger	Pz.Kpfw.IV	Panther	Tiger
68%	62%	70%	71%	65%	65%

Because of the different reporting system, the technical reliability of German Panzers cannot be directly compared to U.S. tanks. A

▼ Alfred Rubbel with his trusted crew in front of his first Tiger '114'. All in all he went through three Tiger '114's. *AR*

tank in a US armored unit that could not be repaired within 24 hours was written-off the inventory and sent off to the rear. At that point, the unit commander lost control of that particular vehicle. In contrast, a German Abteilungs- or Regiments Kommandeur could show up at the workshop every evening and "beg for" or "demand" the workshop personnel's best effort so that he had the highest possible number of operational Panzers available the next day.

A British report could thus show 200 M4 (diesel) tanks operational and four under repair and no total losses. If compared to German numbers without distinction, it could lead to the false conclusion that the M4 had an operational readiness of 98% compared to the German Panzers of 'only' around 65-70%.

The Panzerregiment Grossdeutschland, a unit that was equipped with the Pz.Kpfw.III and IV as well as the Tiger, and thus was able to compare vehicles, already reported in March 1943 that the Tiger was more reliable than the medium Pz.Kpfw. The report from 13. (Tiger) Kompanie/Panzerregiment Grossdeutschland about their combat period from 7 - 19 March, 1943 said:

> *Despite the teething problems the Pz.Kpfw.VI proved its worth. It can already be said that it is more reliable than the Pz.Kpfw.III and IV. If the necessary routine maintenance can be performed (which means 1 day of technical service for 3 days of operation), as it is practiced for the time being, the Tiger can achieve exceptional success.*

Oberstleutnant Reinhold, part of Pz. AOK. 4 during operation 'Zitadelle,' reported on 26 July 1943 that the Tiger has decisively proven itself. The teething problems could mainly be solved. A weak point still was the transmission.

The reason why maintenance of the Tiger is treated in a separate chapter is actually very straightforward: There simply exists a lot of original documentation covering that subject!

It is not the aim of this work to discuss Tiger tactics since they have already been thoroughly covered in other books. So even though the tactics, especially if wrongly applied, had an impact on maintenance in the sense that more Panzers got damaged or stuck and the repair troops were scattered and thus less effective, they are mostly omitted here. It shall only be mentioned that, even in the last stages of the war, i.e., over two years after the first Tigers had appeared on the battlefield, the Tiger-Abteilung commanders still complained about them being incorrectly deployed. The incorrect and, according to the reporting commanders, sometimes even reckless employment by their superior units, which sometimes were non Panzer units that lacked the understanding of Panzer tactics and their needs, affected their operational readiness.

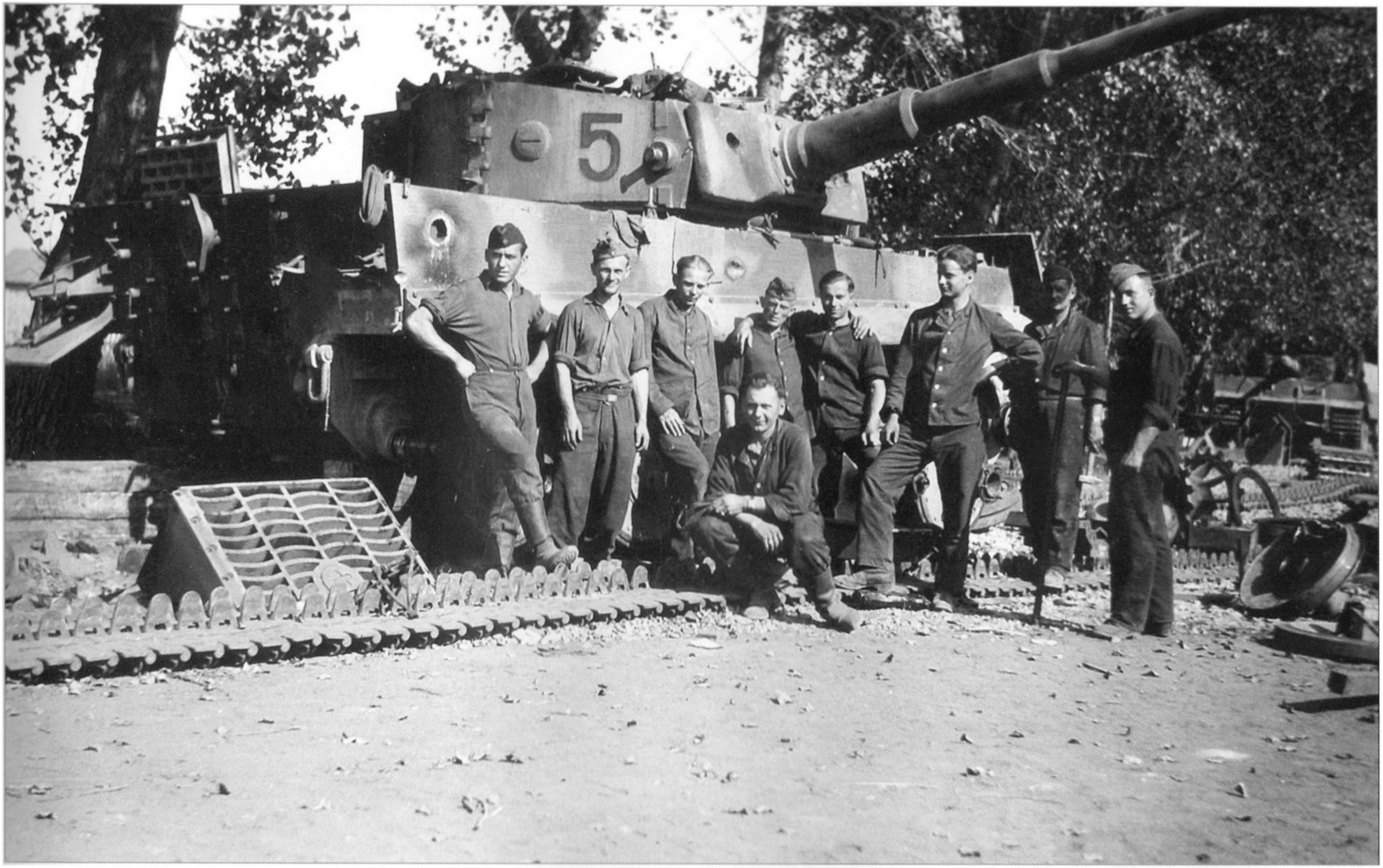
Such wrongful deployment was described by s.Pz.Abt.506 on 15 January 1944:

> *In these constant actions of which one lasted 12 days, servicing and maintenance of the Tigers was neglected and the failures were accordingly high. The Abteilung went into action with 15 Panzers on January 2. On the evening of January 14, none were operational anymore. The last 2 Tigers had driven approximately 340km. Most of the Tigers drove 250km without time for servicing. The comprehension of the Tiger serving as 'Rammbock' (battering ram) in the attack and as 'Prellbock' (buffer) in the defense remains the same as last year.*

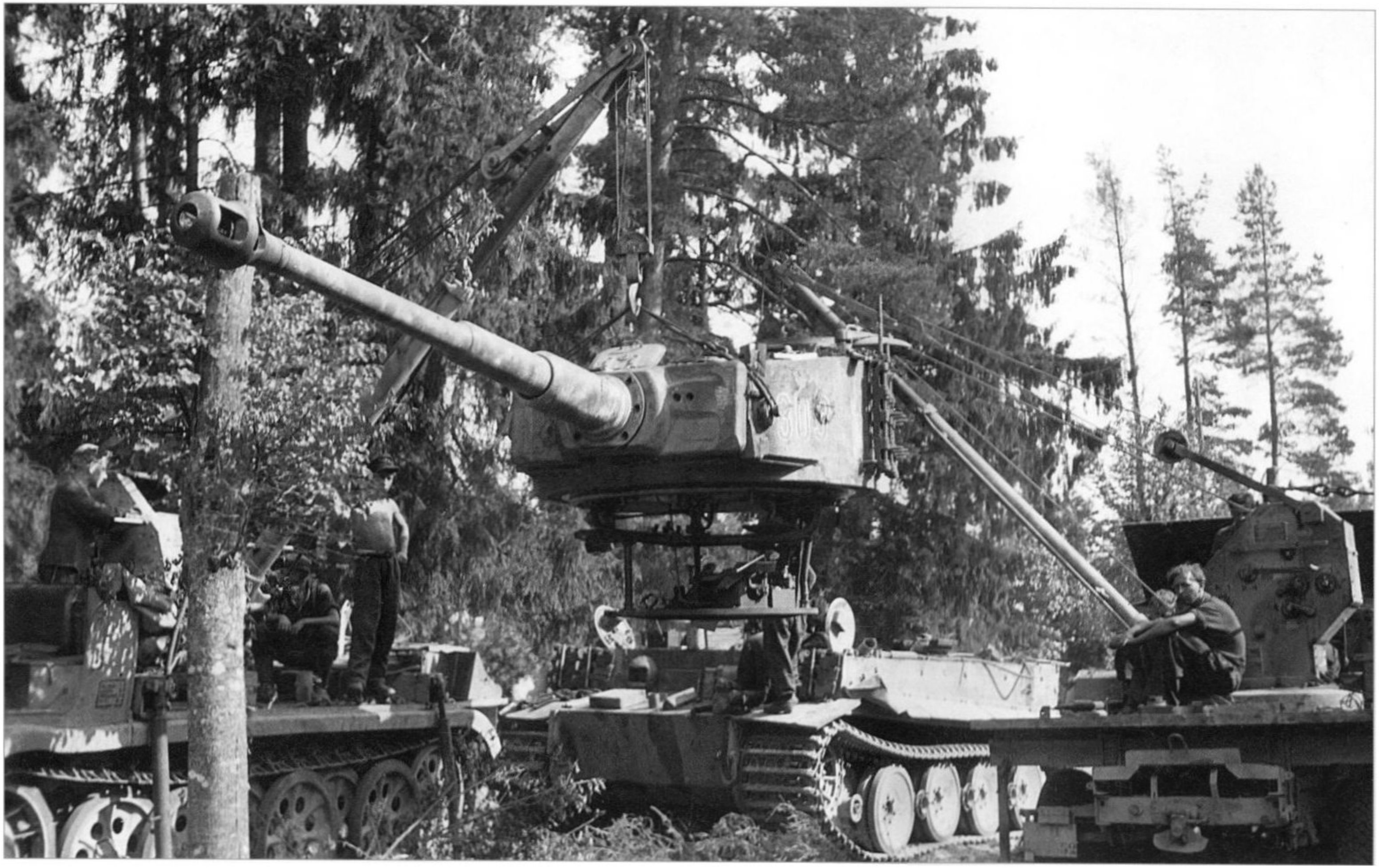
The commander Hauptmann Lange states further that instead of constantly employing the Tigers as rolling bunkers between larger battles, time for maintenance and repair must be granted. The Tigers shall then be ready to be deployed in the decisive moment.

A few months earlier, on 4 October 1943, s.Pz.Abt.506 had already complained:

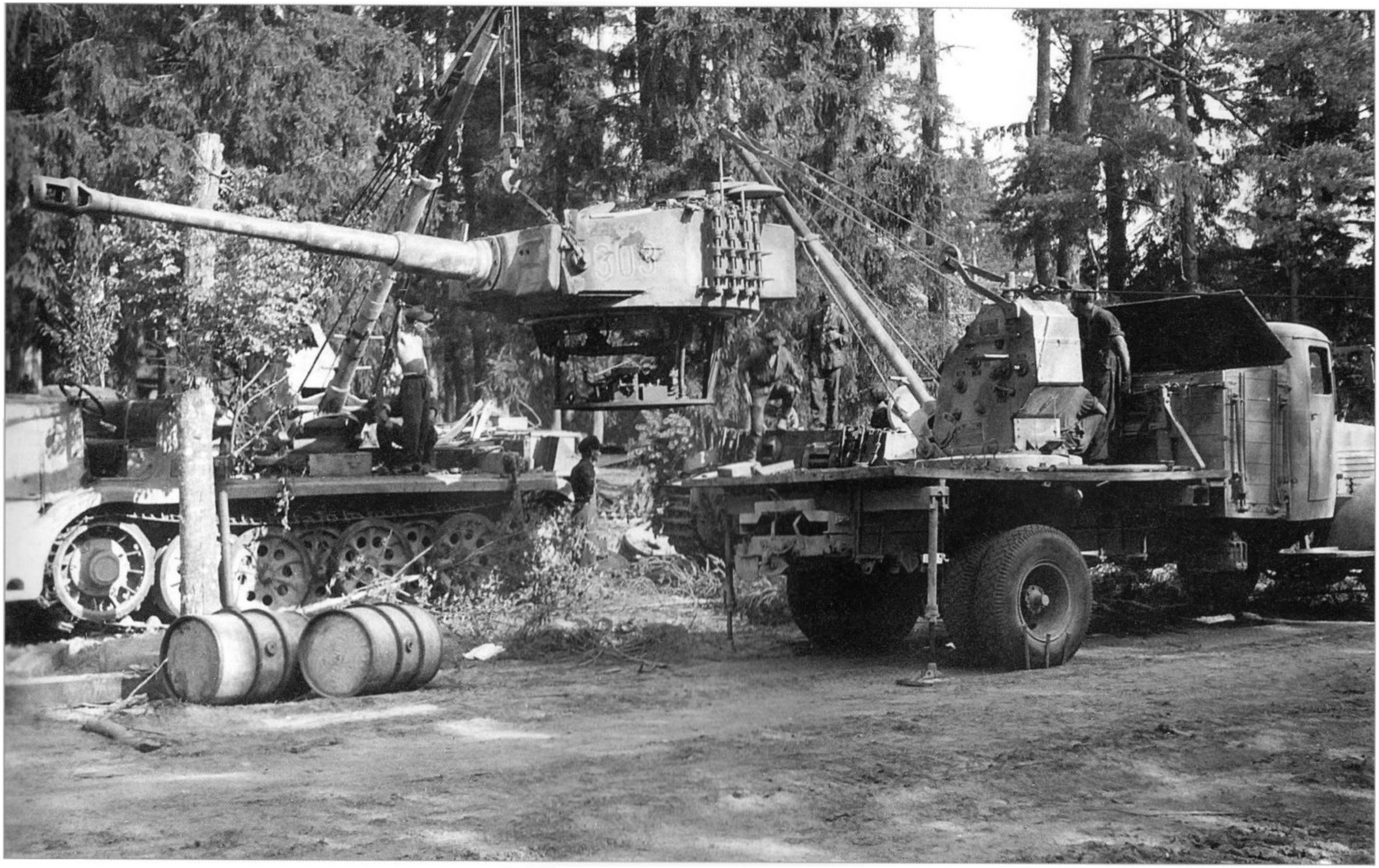
- *Everybody thinks the Tiger is invincible! Hence the wrong deployment.*
- *500m from the front, 1500m from the side!*
- *Difficulties working together with infantry.*
- *It is not a Sturmgeschütz.*
- *Great strain on the loaders, 9 passed out!*



▲ The Pz.Off. at Chef Gen.St.d.H on 7May43 after having visited Gruppe Weiss: "In general, HGr and Armee only knew the Tiger from the 'Völkische Beobachter', especially that it was completely invulnerable and could knock down trees of 1m thickness". *AMC*



▲ Tiger '303' of s.Pz.Abt.502 somewhere in Spring/Summer 1944. Armored units were generally under-equipped with lifting equipment. Their scattered deployment aggravated this situation. *AMC*



▲ Notice that the Kfz.100 is secured by a cable attached to the top of the crane and its wheels are secured probably by track pins. *AMC*

- *Abteilung has only 5 Zugmaschinen instead of 13.*
- *Spare parts supply from Blodischew hindered. Werkstatt has no experience yet! No stock of spare parts, electric welding gear is missing.*

Reports from other independent Abteilungen such as the s.Pz.Jg.Abt.559 (Jagdpanther) dated 28 September 1944 show that even late in the war the appropriate tactics were still not understood by some superior units and not enough attention was paid to maintenance:

> *This situation led to the Panzers being in action for so long that they were either totally lost or small mechanical problems left unattended degraded to where major repairs were needed in the Werkstatt and they fell out for a longer period. As an example the Panther-Kompanie, which must absolutely be serviced after driving 250km, drove a stretch of over 600km without any maintenance halts. Sufficient examples have occurred as to how detrimental this can be on the vehicles, resulting in decreased combat capability of the whole unit.*

The s.Pz.Abt.503 took the same line and reported about their time on the Eastern Front after October 1944:

> *During these weeks up until today, the Abteilung was not allowed any time to carry out maintenance and repair work, despite repeatedly requesting so. This was partly in consequence of the situation, but also because of the absence of understanding from superior commanders.*

Long deployment without pause or long road marches without enough time to perform regular service such as lubricating or checking the tracks later often results in more severe break-downs. The scattered deployment of the Tigers weakened their support by the I-Dienste. The I-Gruppe of the company could only repair minor damage. To repair more serious damage, the cranes from the I-Staffel or the workshop company were crucial. The battalion though had only one I-Staffel for 3 Tiger companies that were often deployed separately. In favour of good maintenance support, an independent battalion should have been deployed as a whole.

The independent Tiger units are often said to have been used as a "fire brigade" at the hot spots of the front – this as an excuse for their mechanical break-downs. However, such claims cannot be backed up since all Panzer units or new weapon systems were usually sent to the decisive zones of combat. Furthermore, all type of Panzers had to face enemy mine fields, suffered from insufficient reconnaissance and difficult terrain to the same extent.

Like with other independent Panzer and Panzerjäger units, independent Tiger battalions were missing connection to a parent unit. This sometimes made it more difficult for them to get supplies, though the difficulties occurring with spare parts supply were, at least for Panther and Tiger units, somehow compensated for by preferential delivery by air transport or Blitzpfeil transport (prioritized rail transport).

Not an independent Tiger battalion but an independent Heeres-Panzer-Jäger-Abteilung (563) reported on 21 March, 1944, that when they were subordinated to a division, the division often:

> *Was not capable of supplying the Abteilung with enough fuel and ammunition. For these reasons the divisions refuse provisioning while the Korps orders that the Abteilung provides for itself from the army stores. The long supply routes are unbearable because the Abteilung has not enough transport capacity. The work is made especially complicated as the Heeres-Panzer-Jäger-Abteilungen has no higher command headquarters which takes care of the Abteilung accordingly.*

The first experiences made with the Tiger, summarized by the training school at Paderborn, point out such problems as well:

> *Referring Tigers to the workshop companies of light Panzer units is impracticable for Tigers because of the lack of technical knowledge, spare parts and special tools. The troops in the field need to keep a stock of Tiger spare parts with them. At least one extra transmission and engine must be with the troops.*

A report from the commander of the III. Abteilung (Tiger) Panzerregiment Grossdeutschland from 31 August 1943 shows the desolate condition in which this newly formed Tiger unit was actually sent to the front.

> *Marching distance from the unloading station to the Abteilung's command post was 110km. The Stab had three Tiger-Befehlswagen and seven SPW from the reconnaissance platoon without weapons available, the 10.Kp. was full except one Tiger that was still in Germany. Four Tigers and most of the I-Gruppen equipment of 11.Kp. burnt out during transport. The 9.Kp., which was the former 13.Kp. and saw combat during operation 'Zitadelle,' had no operational Tigers. The Abteilung was further missing the whole Stabskompanie, the Wkst.Kp. (except the 1. Zug) and all wheeled vehicles of the Stab. On the evening of 14 August 1943 the Abteilung had a total of 16 Tiger (including three Befehlswagen) operational. Ten Tigers failed on the march to the command post with smaller and larger damages. It already became noticeable that the Abteilung was sent to combat without any supply units, no I-Dienste, recovery platoon or spare parts. In the following fighting days, the absence of those vital supply units for every Panzer unit, especially the I-Dienste, had an ever increasing and more critical impact. A report about it will follow.*

In the same report, the combat commander noted on 26 August 1943:

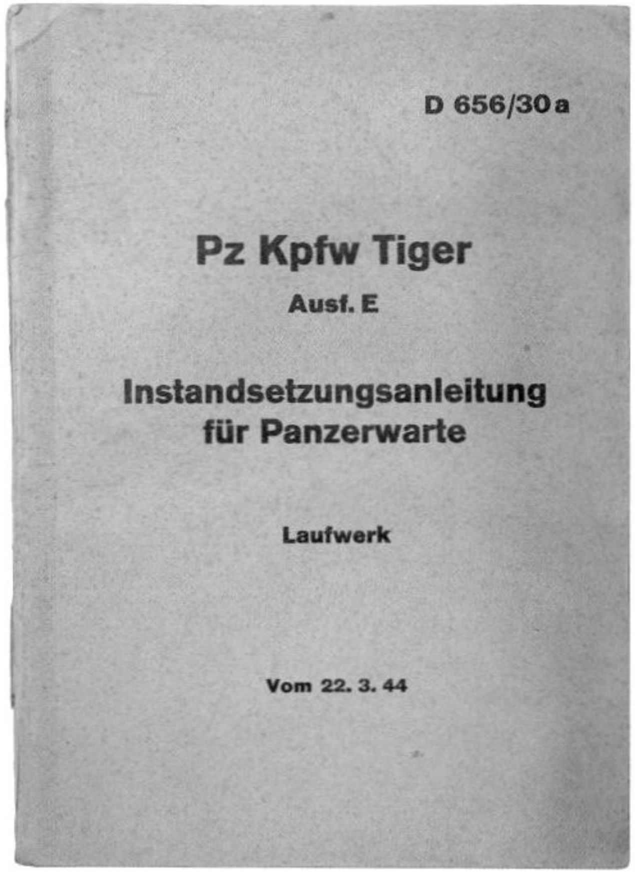
> *Except on the first and second day of operation, only an average of 2 - 3 Tiger were operational on combat days. Due to the strong enemy defense, the operational strength sank rapidly down to 6 and finally 3 Tigers also on the first day. On these eight days of combat, these few Tigers destroyed a total of:*
>
> *54 Pak, Flak and guns, 42 Panzer and Sturmgeschütze, 1 Panzerspähwagen and numerous anti-tank rifles and infantry.*
> *The low combat strength (of which practically only 2 companies can be counted since not a single Panzer of the 9. Tigerkompanie that already was with Grossdeutschland went into combat) is almost entirely attributed to the lack of the I-Staffel and the Werkstattkompanie with its spare parts.*
>
> *The Werkstattzug as well as the I-Gruppen of the companies have very well trained qualified personnel, which in indefatigable, self-sacrificing day and night work and despite the few available working materials, kept the Tigers operational. Because of the small number of Tigers going into combat, the attrition and the loss due to shelling was relatively high, so that in general with the supply from the I-Gruppen and the Tiger-Werkstattzug just 2 – 3 Tigers could be kept operational.*
>
> *Especially difficult was the recovery of damaged Tigers because of the lack of its own recovery platoon. The three Zgkw. available from the Werkstattzug could never cope with the number of losses. It thus was necessary to fully use a recovery platoon of the Armee at all times. A summary report will follow. After a march of 45km, only one Tiger from the six Tigers that arrived from Germany in Poltawa on 26 August 1943 is still operational.*

As these reports show, a lot of external factors can influence the serviceability of a Panzer in the field. Just by its size, the Tiger needed more time for preparation. This is described in a report of the training school at Paderborn as of 8 June 1943:

> *Depending on the length of the route of advance, the assembly positions (Bereitstellung) have to be reached 12 - 14 hours before the attack. This time is needed to repair light damage that might have occurred. Refueling and reloading ammunition takes twice as long as with a Pz.Kpfw.III or IV. The exchange of an inner road wheel takes at least 10 hours even with a well-rehearsed crew.*

While the outer road wheels were more exposed to shell fragments, the inner road wheels showed heavy wear from the weight of the Tiger (s.Pz.Abt.501, 17 December 1942). On 18 March 1943, the Kommandeur of s.Pz.Abt.501, Major Lüder, reported about their experience with the Tiger in Tunisia:

> *... Tiger units cannot march within a light Panzer unit over longer*



D 656/30a

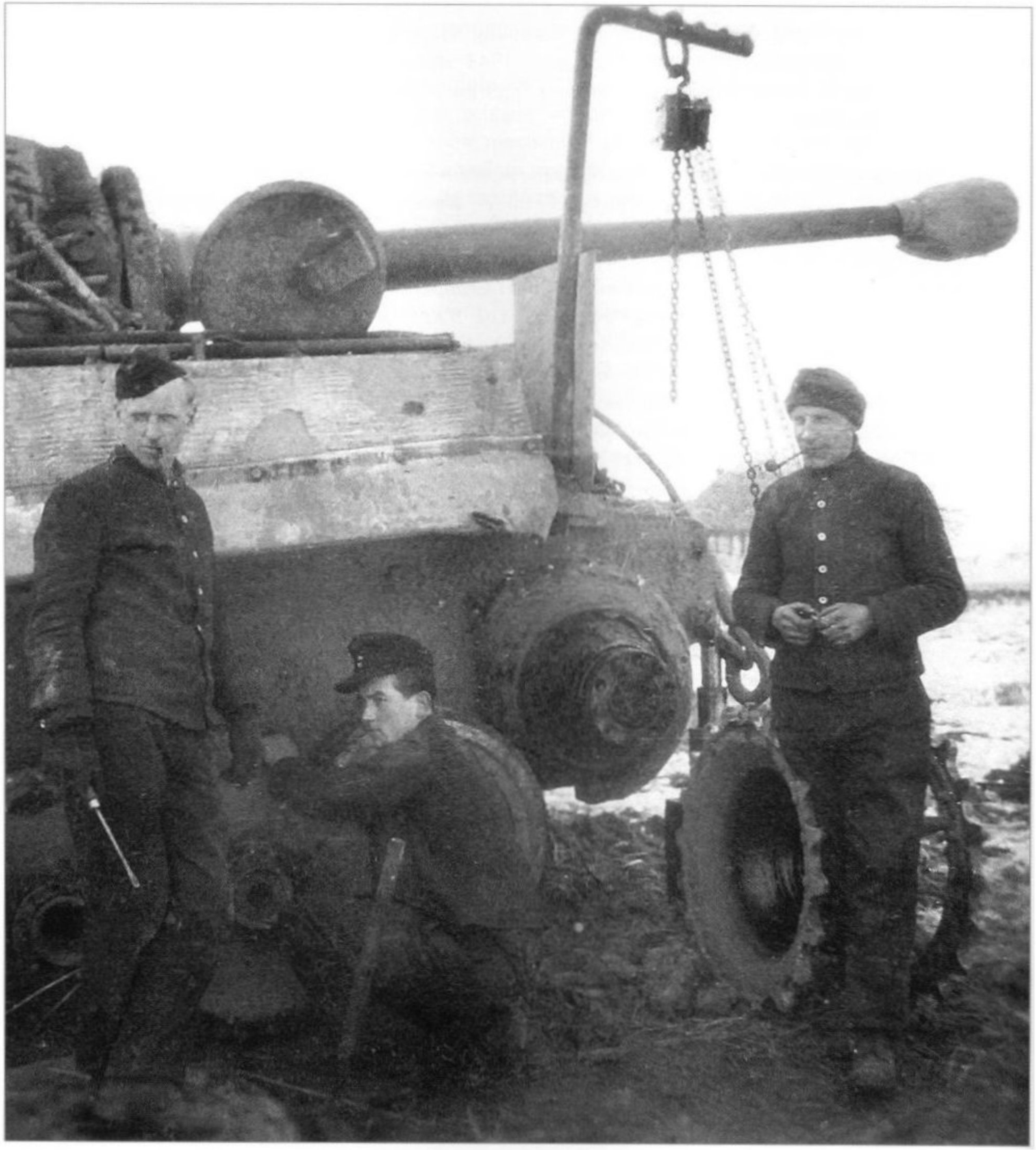
Pz Kpfw Tiger

Ausf. E

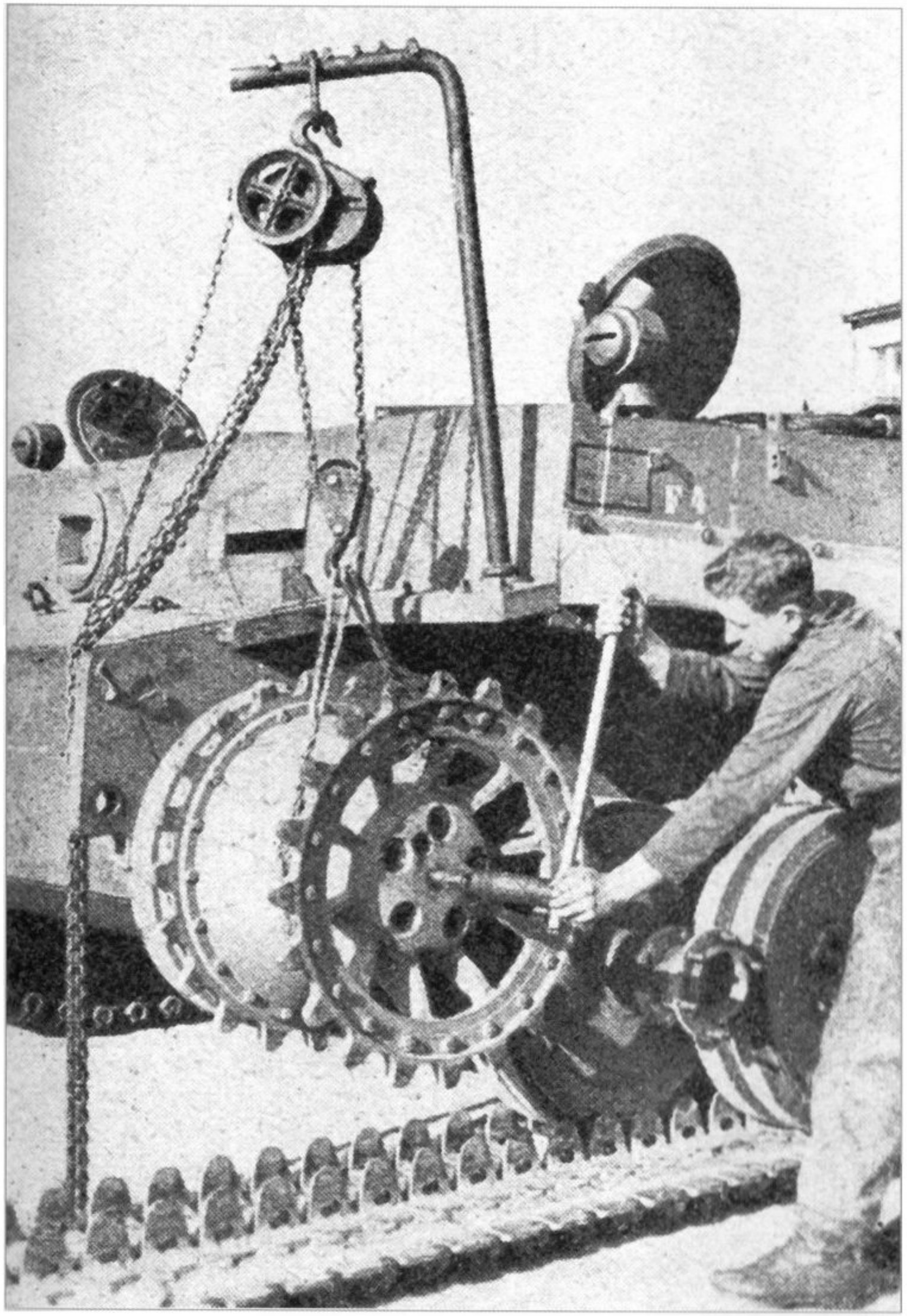
Instandsetzungsanleitung
für Panzerwarte

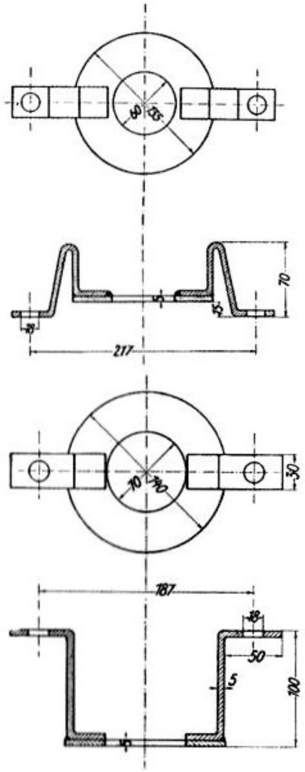
Laufwerk

Vom 22. 3. 44



One of 45 new Tiger I's received by the reconstituted s.Pz.Abt.501 in October and November 1943, following the loss of all its Tigers in Tunisia. The turret number '221' is in the Abteilung's typical dark outlined style and partly obscured by mud applied over the turret whitewash. The hull is raised by a hydraulic jack, positioned in front of the sprocket, under the right towing eye. Above is the maintenance manual for Panzerwarte for the suspension of the Pz.Kpfw. Tiger Ausf. E from which the excerpts on the following three pages were taken. *AMC, AT*





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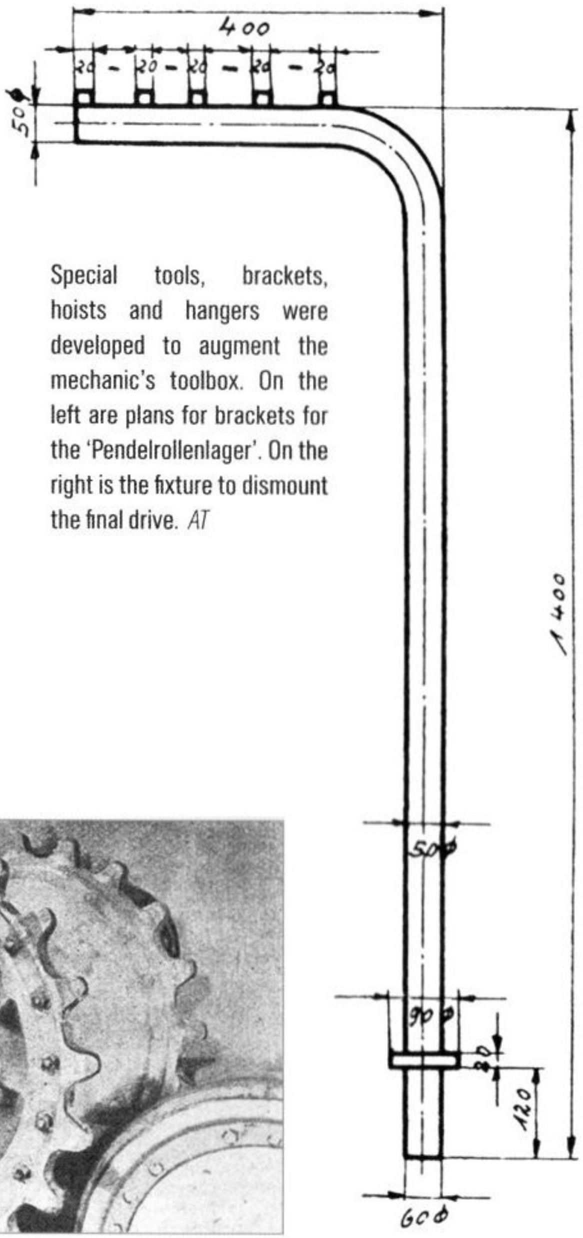

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90ϕ
30
120
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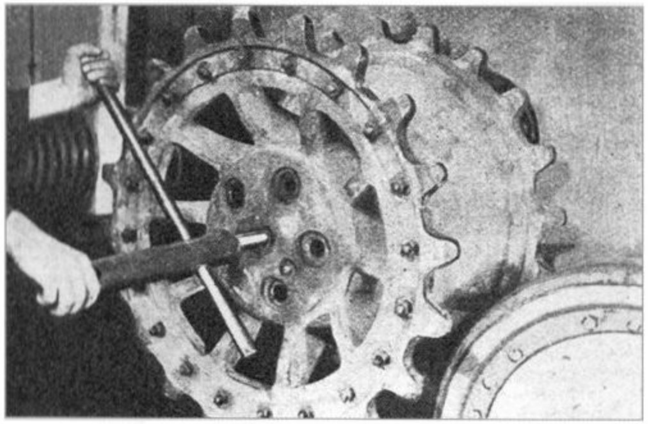
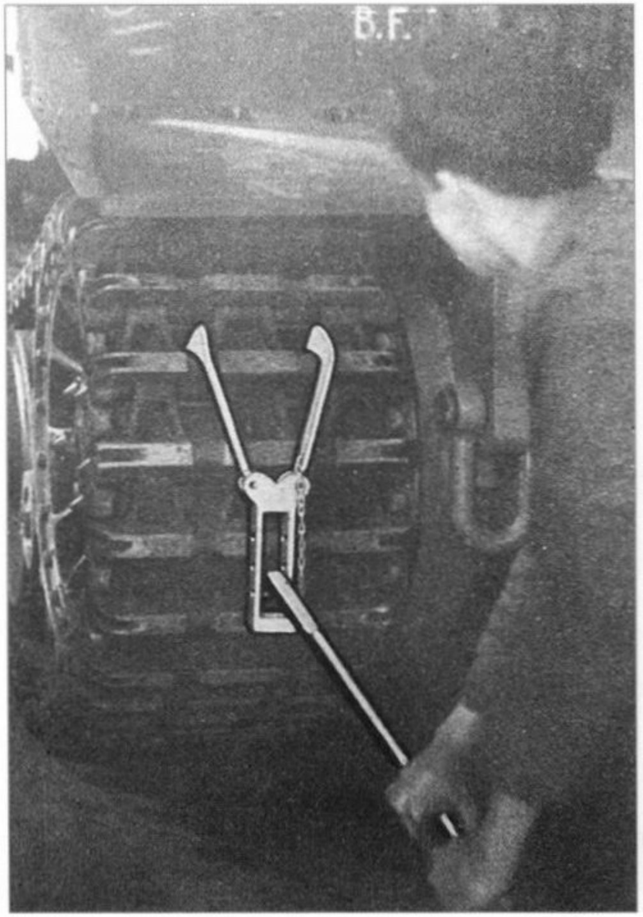
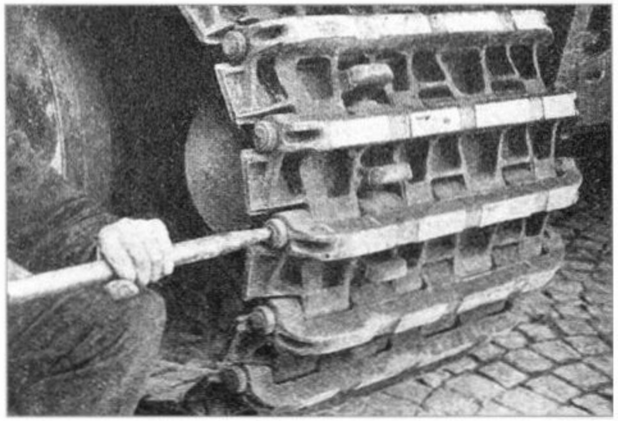
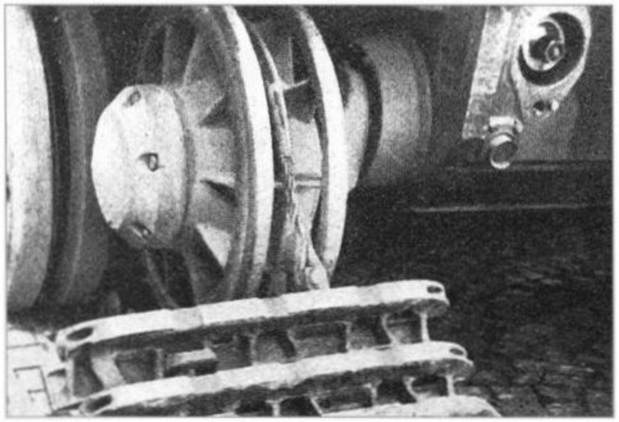
Special tools, brackets, hoists and hangers were developed to augment the mechanic's toolbox. On the left are plans for brackets for the 'Pendelrollenlager'. On the right is the fixture to dismount the final drive. *AT*

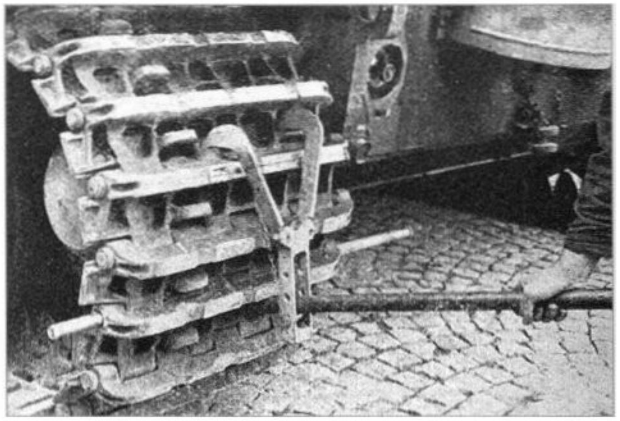


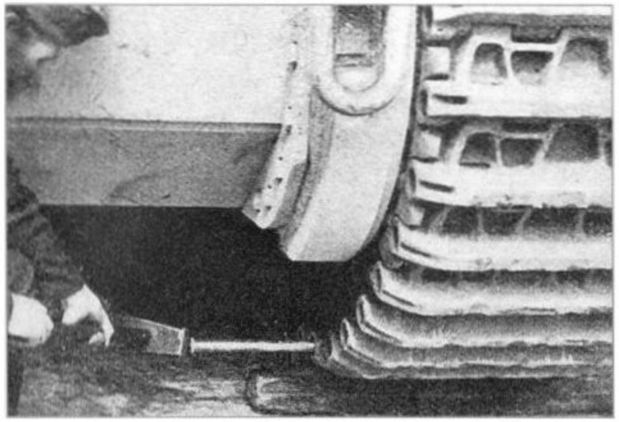
To remove the sprocket, it first had to be secured by a pulley, then you screwed in the ejector screw. *AT*

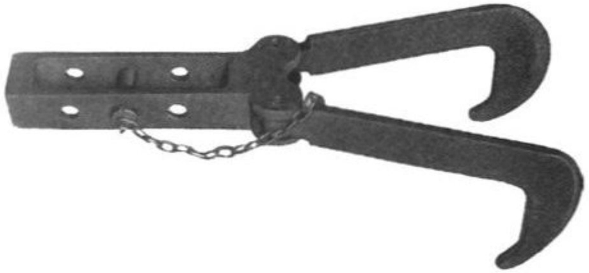




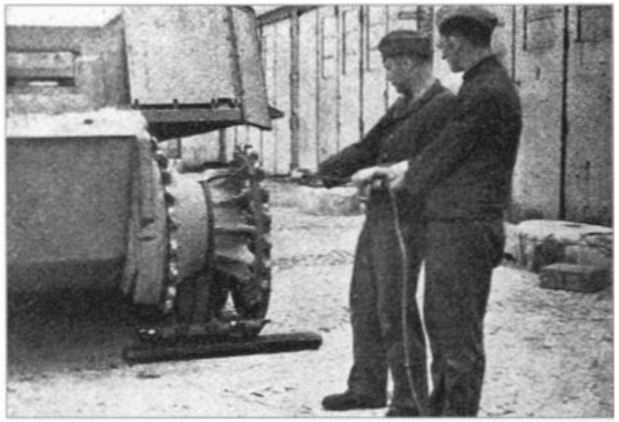


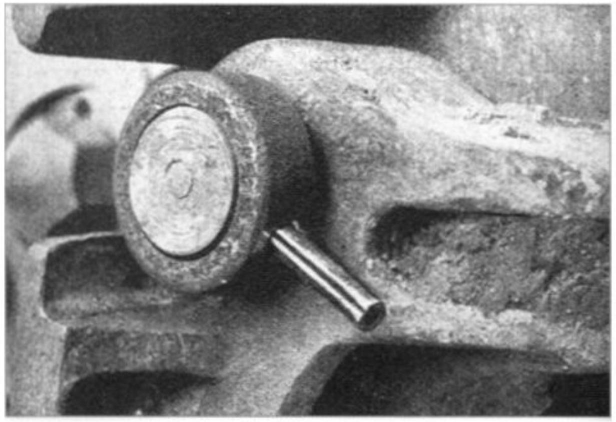


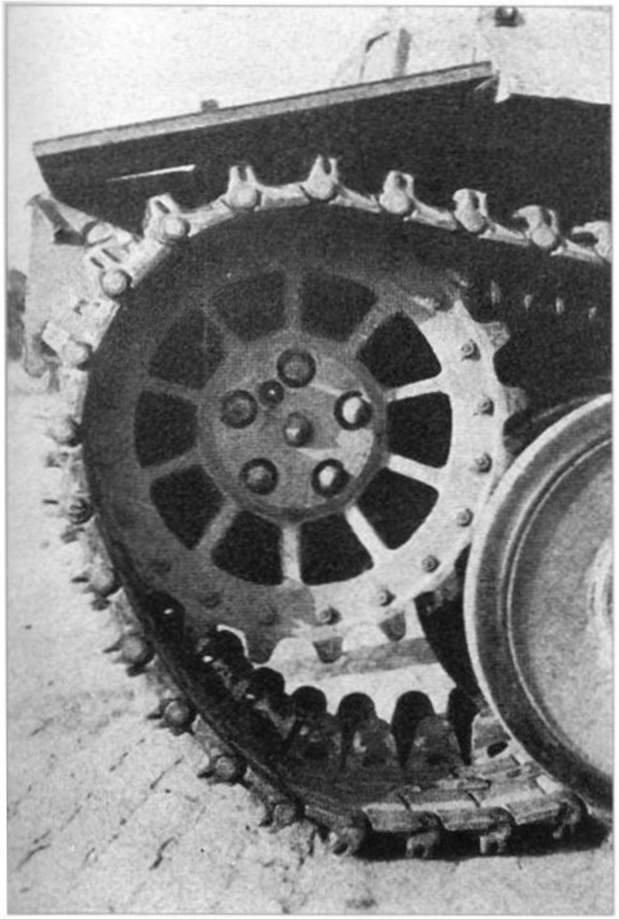


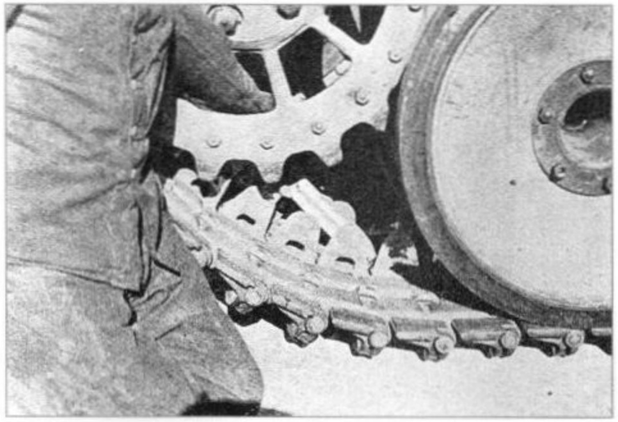


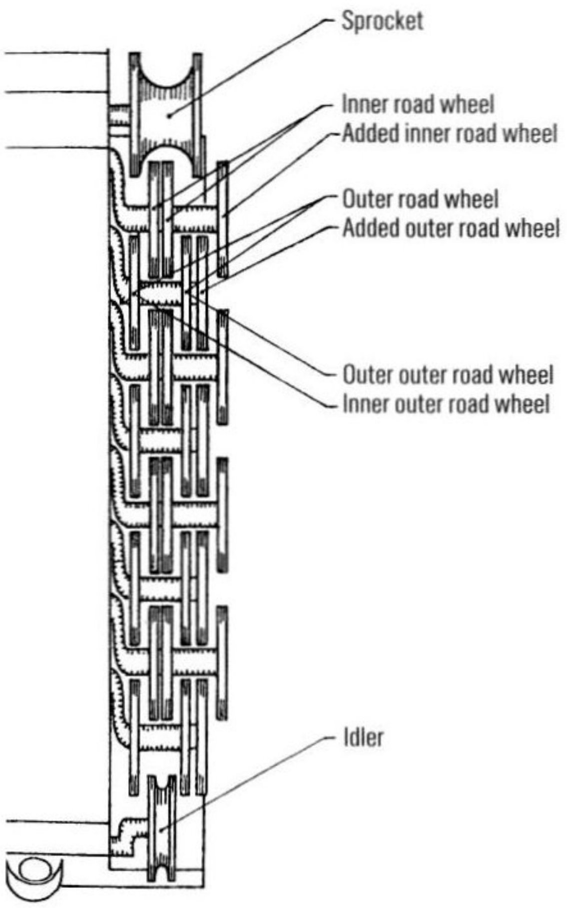
To open a track, the track pin had to be punched out with Spike K 7644/44 from outside to the inside. The track links were kept together to remove the spike with ease. Continues on the next page.

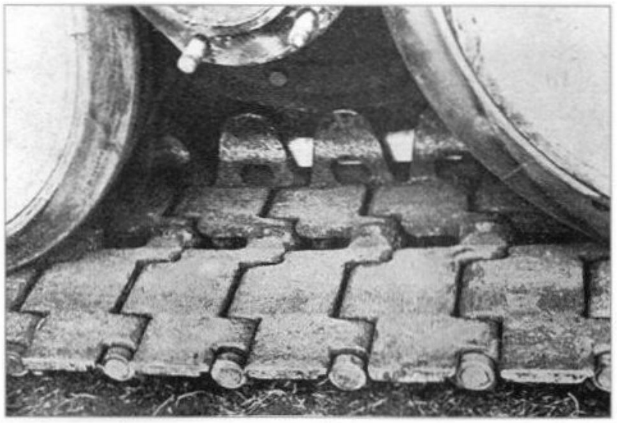








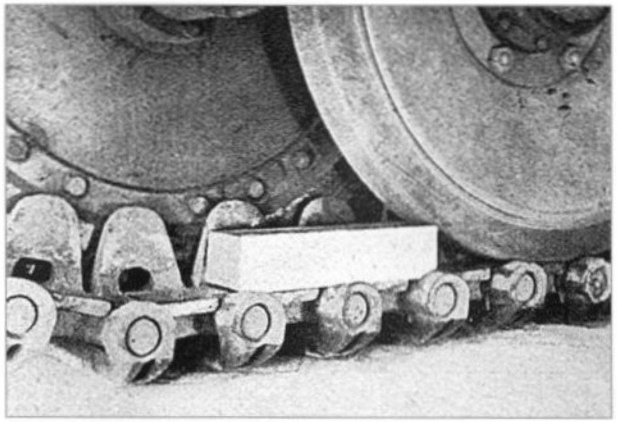

Sprocket
Inner road wheel
Added inner road wheel
Outer road wheel
Added outer road wheel
Outer outer road wheel
Inner outer road wheel
Idler

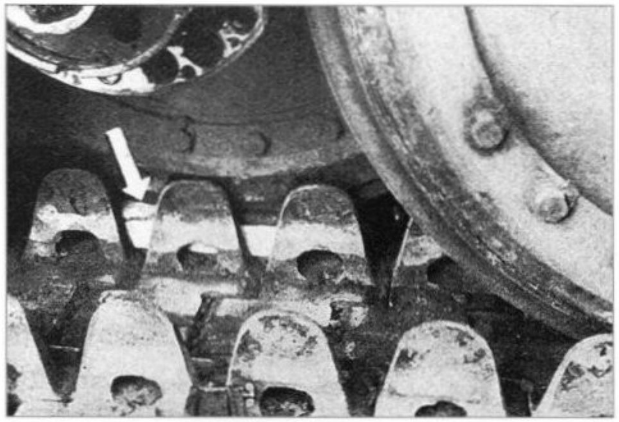


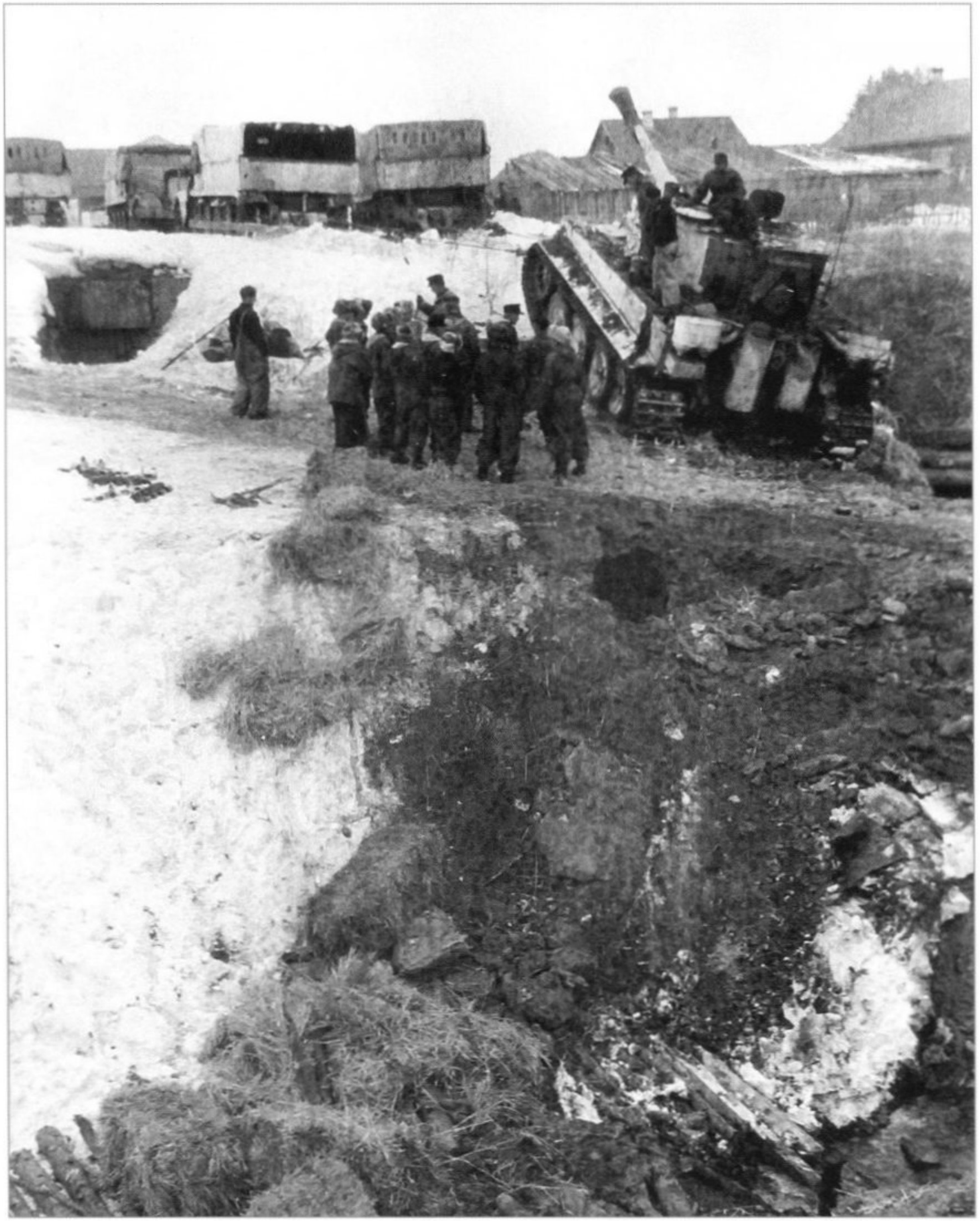
◀ The Panzer was then driven forward so that the track ran over the sprocket in front of the Panzer. With the track changing cable run twice around the sprocket, the track could be pulled forward until the track links were caught by the sprocket's teeth. *AT*

▲ To remove a damaged track link, the link had to be driven free under the sprocket. Slacken track. Tighten it with the engine, so it hangs loose under the sprocket. *AT*

▶ To remove an added inner or added outer road wheel, the Panzer could simply be driven onto a block of wood 250x200x40mm [sic] until the inner/outer road wheel sat on top of it. *AT*







distances, especially not in unfamiliar terrain, because bridges, passages, etc. can bear surprises that could cause a stop to the whole formation. On known roads over shorter distances (up to 30km) the incorporation of Tigers into a le.Pz. unit is possible. ... In muddy or slippery terrain the Tiger has the same or even better ride quality than the light Pz.Kpfw.

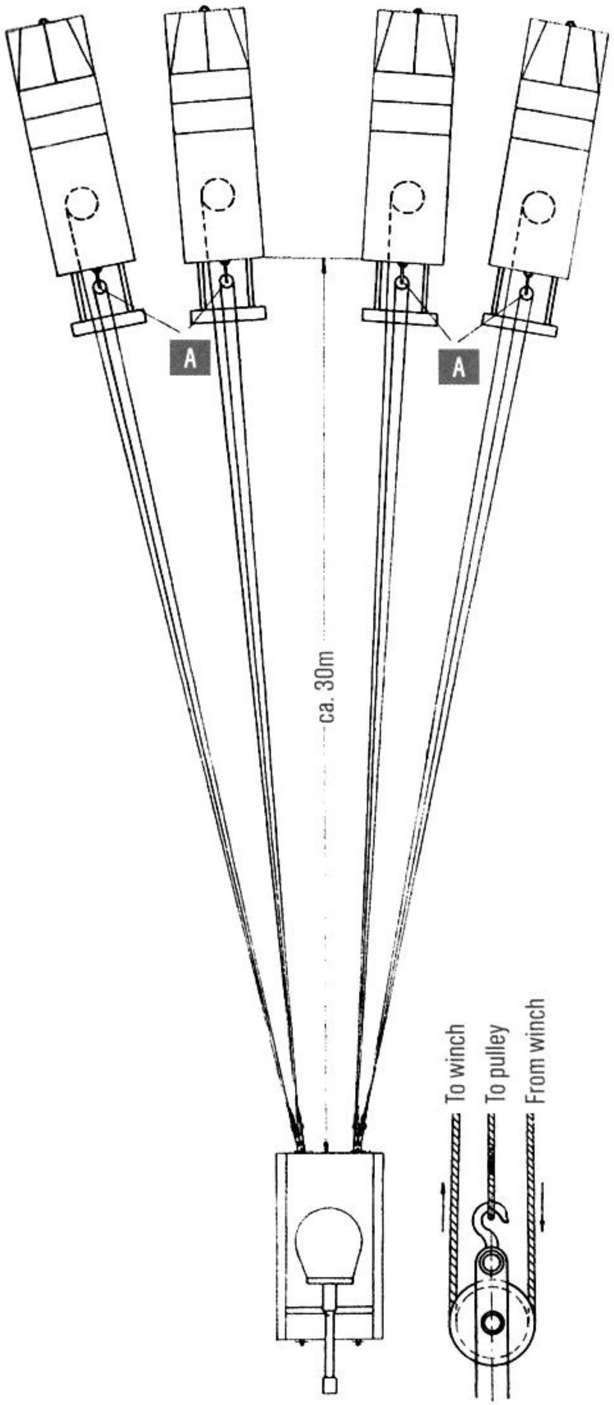
Tigers need many technical breaks on the march. One after 5km and then every 10-15km. If possible, it should be marched on soft ground. Because of their hardness and camber, asphalt roads especially wear out the inner road wheels too quickly. Replacing the road wheels consumes a lot of time.

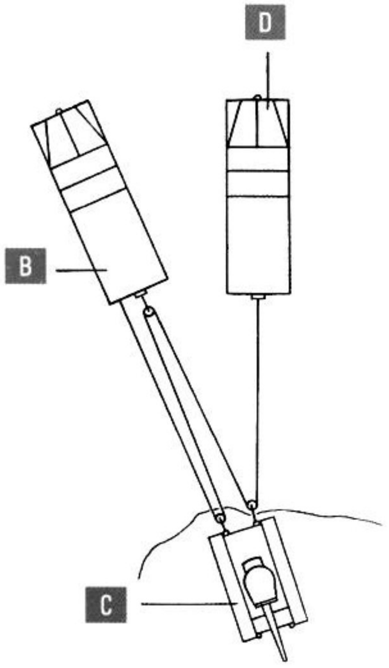
During the march, I-Gruppen, as well as engine and transmission specialists from the firms, have to be with the companies! The drivers must be taught to not repair even the smallest damage on the transmission themselves. Unschooled drivers can often help the Tiger to continue for the moment, but the small damage soon results in a long absence for maintenance.

To go easy on the road wheels is important, so drive slowly even if it causes higher fuel and oil consumption. ...

High fuel consumption by the Tiger, high tonnage needs for its ammunition and large spare parts, as well as bringing along all special spare parts, make the supply and maintenance of Tiger formations one of the most important aspects [of operations]. When cooperating with light Panzer formations, it has to be kept in mind that each Tiger needs to get special attention from trained personnel. Referring to I-Dienste of light formations is not practical.

◀ At least four s.Zgkw. were used to have Tiger '101' from s.Pz.Abt.505 pulled from a muddy end. Note how the winter whitewash has not been applied to the deck of the hull and how the base color also shows where the stowage box behind the roof has been removed. *AMC*

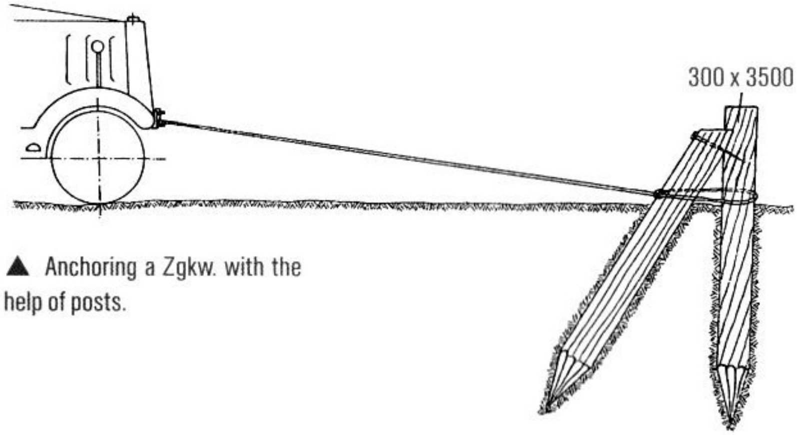

A
A
ca. 30m
To winch
To pulley
From winch



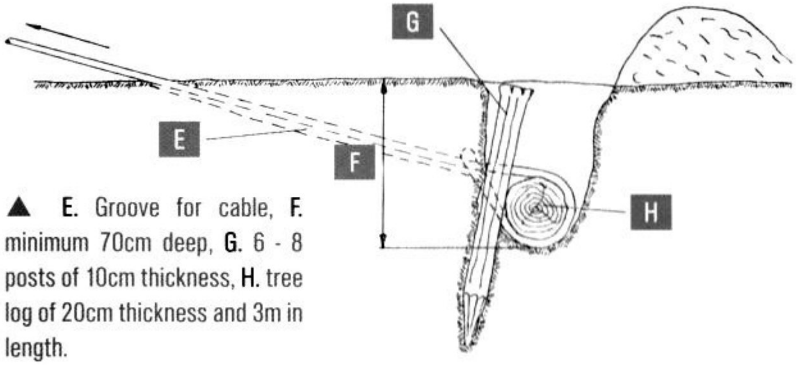
▲ Fourfold cable pull with snatch blocks. *(D)* functions as anchor, *(B)* is working with its winch and *(C)* is the Panzer to be recovered, with two snatch blocks attached to the Panzer.

◀ **A.** Snatch blocks ('lose Seilrolle'). Plan for recovery with heavy double pulleys; each Zgkw. in trifold cable pull. Drawings and text are from the 'Bergen von Panzerkampfwagen'. D659/4.

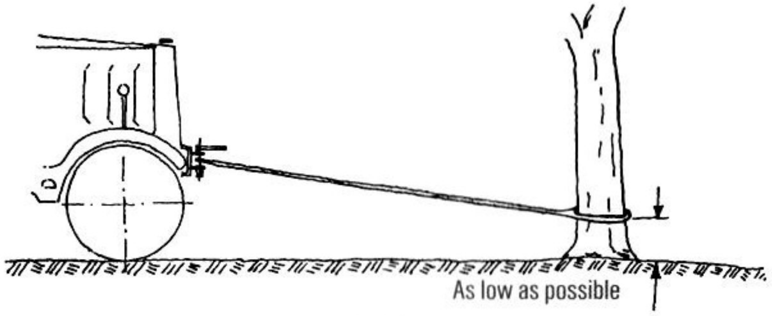
▶ **I.** Using a Tiger and its two tow cables as anchor in a dug out track.

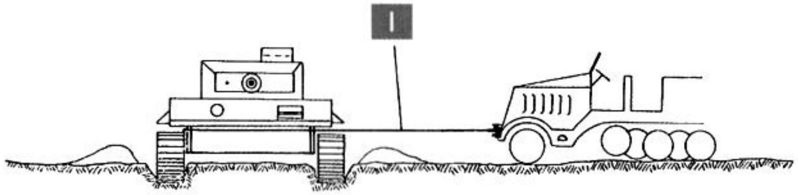


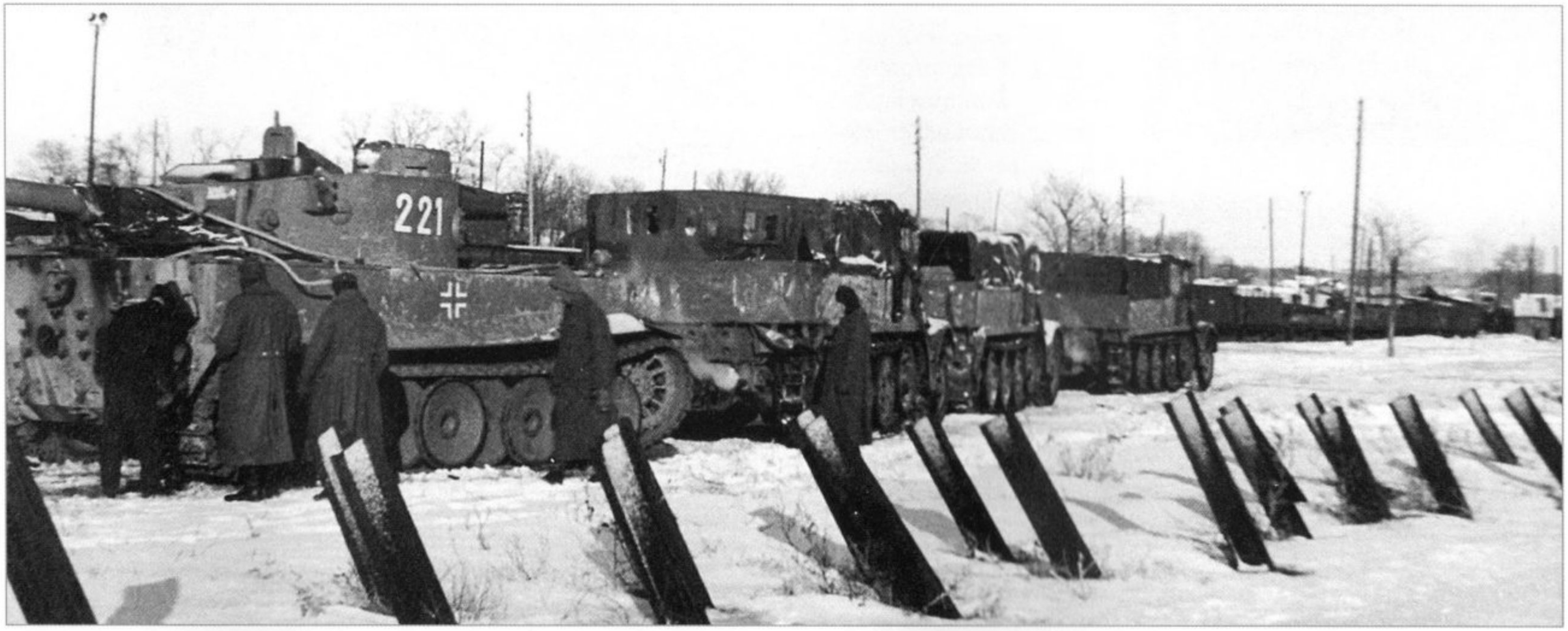
▲ Anchoring a Zgkw. with the help of posts.



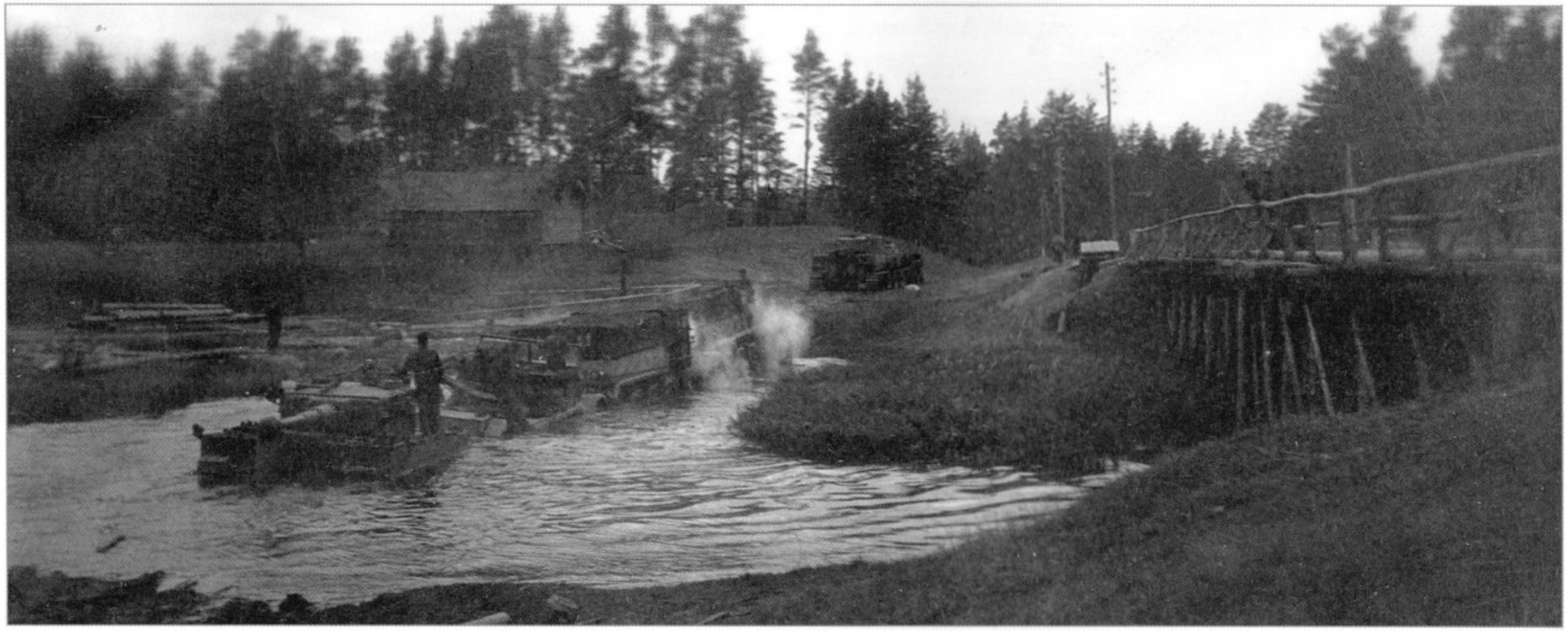
▲ **E.** Groove for cable, **F.** minimum 70cm deep, **G.** 6 - 8 posts of 10cm thickness, **H.** tree log of 20cm thickness and 3m in length.


As low as possible

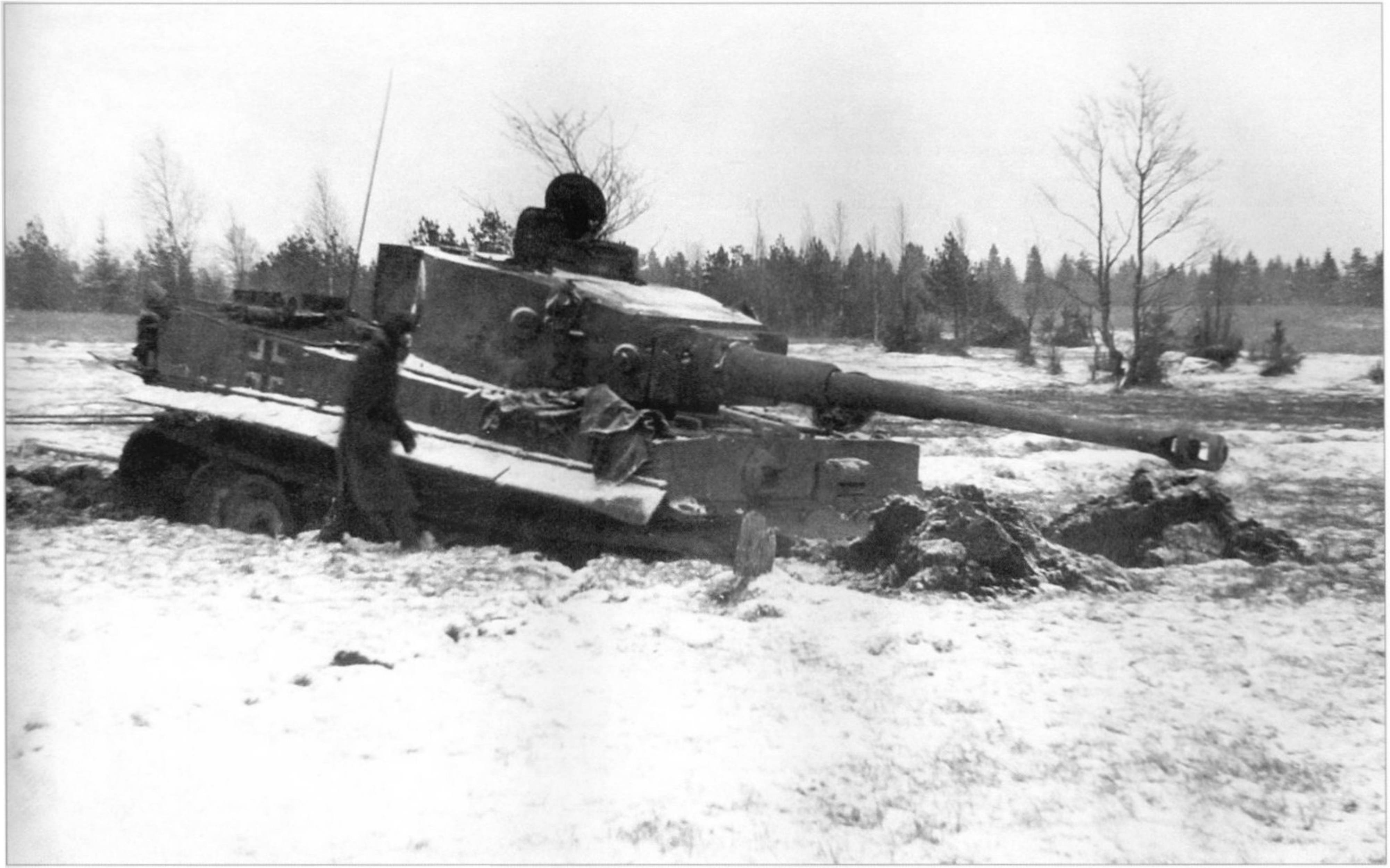




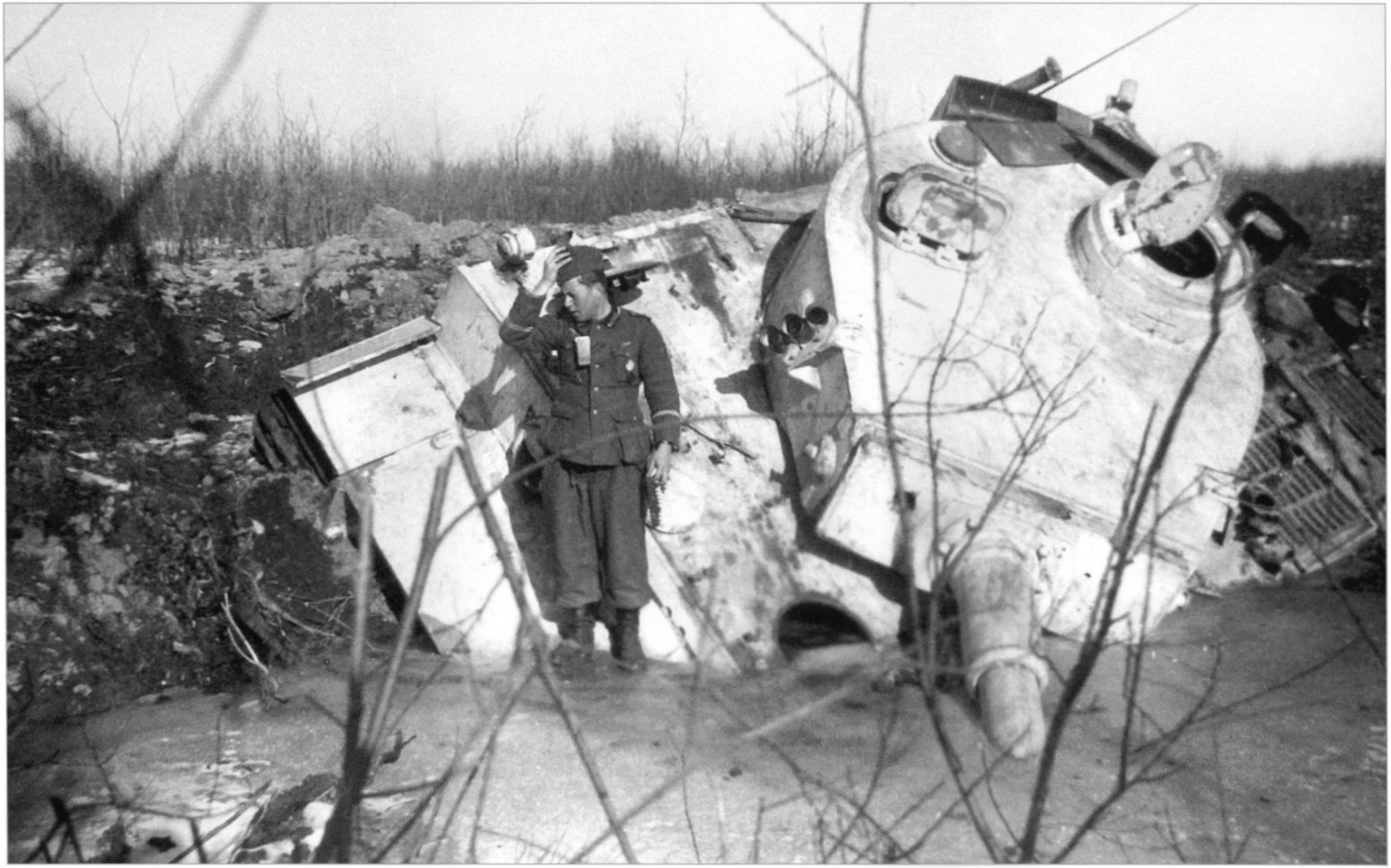
▶ 'Panzersperren' as seen protruding from the snowy field here can also be hidden under large snow drifts. Here a trio of Zgkw. are set to tow Tiger '221.' *AMC*



▶ Three Zgkw. tow a Tiger through a river. It cannot be determined if the Tiger on the other side is used as an anchor or not. *ØL*



▲ A 2./s.Pz.Abt.502 Tiger bogged down in the winter of 1943/1944. Taut tow ropes at the rear indicate that recovery is underway. It is one of the last Tigers produced without track link stowage on the turret side or a visor for the loader. *AMC*



▲ A Tiger I is frozen fast in its predicament as a Landser considers his own dilemma. Swings in temperature of only a few degrees could upset even the best laid plans. Note the smoke grenade discharger on the corner of the engine deck. *AMC*

A Healthy Child Can Also Break a Leg

In its technical report No. 6 about the deployment of the Tiger in Tunisia from 3 March 1943 - 1 May 1943, dated 3 May 1943, the Truppeningenieur of s.Pz.Abt.501 reported on the Tiger's performance and the damage incurred in combat:

> *Most significant in recent deployment was that it was possible to send the Tigers directly into combat after a march of 400km. Even though the Tigers could then not leave the battle field under their own power and needed to be recovered, it is already proven that it can keep the marching tempo of the light Pz.Kpfw., which so far was not beyond it. It would be interesting to know if the Tiger could finish a mission after marches exceeding 300km, if there was time for a check-up. So far this could not be tested.*
>
> *To the mission mentioned above (disengage from the enemy in the area Sfar - Maknassy-Pass) it has to be added that there was not time to check the Tigers recovered by the I-Dienste. It was necessary to recover the Tigers as fast as possible from the territory threatened by the enemy, thus it was not possible that the Tigers could march on under their own power after short maintenance, as is normally usual. The damages incurred were the ones already known: Leaking steering arms, changing gear jamming, damaged final drive, leaking radiators, overheating engines, loosened panhead screws of the sprocket, 'Wasserwellenbruch' [cooling water penetrating the piston walls and oil entering in the combustion chambers], etc.*
>
> *In regard to the overheating problem of the engines, it is still set that the Maybach-Motor HL 210 in recent times rarely caused any technical trouble but that the engine failures are basically caused by insufficiently trained drivers. In several cases the cause was the missing temperature gauge.*
>
> *Five engines reached 3,000km without major damage.*
>
> *A good driver who is well trained in driving as well as mechanics and also keeps calm in critical moments is essential for the deployment of the Tiger. It should not happen that a driver does not even know where the hand starting crank is, or whether the Tiger even has such a thing.*

Losses described only as 'abandoned' or 'self destructed' do not tell us for what reason a Panzer was abandoned or blown-up. To find out what put these Panzers out of action, reports such as the following from s.Pz.Abt.506 are needed. This report also serves as impressive testimony as to what forces these Panzers and their crews were exposed to. The Kommandeur of s.Pz.Abt.506 wrote an experience report dated 30 September 1943, when the Abteilung was subordinated to the 9. Panzerdivision:

Nature of Tiger losses caused by shelling and resulting damage during the first seven days and nights in action from 20 - 26 September 1943:

1. *6 Tigers were lost from direct hits resulting in their burning out. The armor was cleanly penetrated. The caliber of the projectiles is unknown. The vehicles burnt out completely, exploded, and are located in enemy-held territory. The Panzers were knocked out at a distance from about 1000m away. It had to be a Russian Pak (anti-tank gun), an assault gun or artillery.*
2. *1 Tiger was knocked out by a T-34 at a range of about 200m. Two clean penetrations through the side of the hull. The hull is bent, transmission, radio and electric installations damaged, crew wounded. The Panzer could be recovered. It cannot be repaired in Russia.*
3. *4 driver's, 4 radio operator's, 1 loader's and 2 commander's hatch covers were shot off. Thereby equipment in the interior was damaged and the crews were wounded by fragments.*
4. *8 guns and 4 gun mantlets were damaged by hits, 3 of them heavily.*
5. *3 final drives were sprung by hits on the hull front. The extended side walls of the hull were forming a shot trap and prevented the projectiles from skidding off. A one centimeter deep crack was caused and the oil ran out. One of the Tigers cannot be repaired in Russia.*

6. *3 driver's visors and 6 driver's glass blocks were shot off or damaged.*
7. *1 armored guard of the exhaust pipe was shot off.*
8. *15 latches for hatch covers chipped off due to shelling.*
9. *The suspensions of 21 Panzers, including 6 sprockets and 2 idler wheels, were heavily damaged due to shelling.*
10. *6 radiators were damaged by fragments that were caused by hits on the turret.*
11. *14 engines broke down because cooling water leaked out of the radiators (as a result of hits). The engines broke down due to cooling water penetrating the piston walls and oil entering in the combustion chambers.*
12. *3 armored air intake covers and 2 ventilators were shot off.*
13. *16 towing cables and 9 track mounting cables were shot up.*
14. *All dry filters, the tool boxes mounted outside on the rear, and the turret stowage bins were perforated. (As a precaution the Abteilung had ordered to stow all tools on the inside of the Panzers).*
15. *The intercom system failed on 17 Tigers due to vibration caused by shelling (4 tubes, 8 relays, 3 condensers and 2 fuses were broken). Consequently the driver could no longer be directed by the commander, which extraordinarily complicated his guidance, because the Panzer had to halt and the engine be switched off each time the commander needed to redirect the driver. This turned out to be the biggest shortcoming of the Tiger, when approximately 10 guns at close range in a cornfield, that could not be seen by the driver and that were shooting at the Panzers during their advance, should have been run over.*
16. *9 loaders and 1 radio operator fainted due to exhaustion and* CO_2 *gas.*

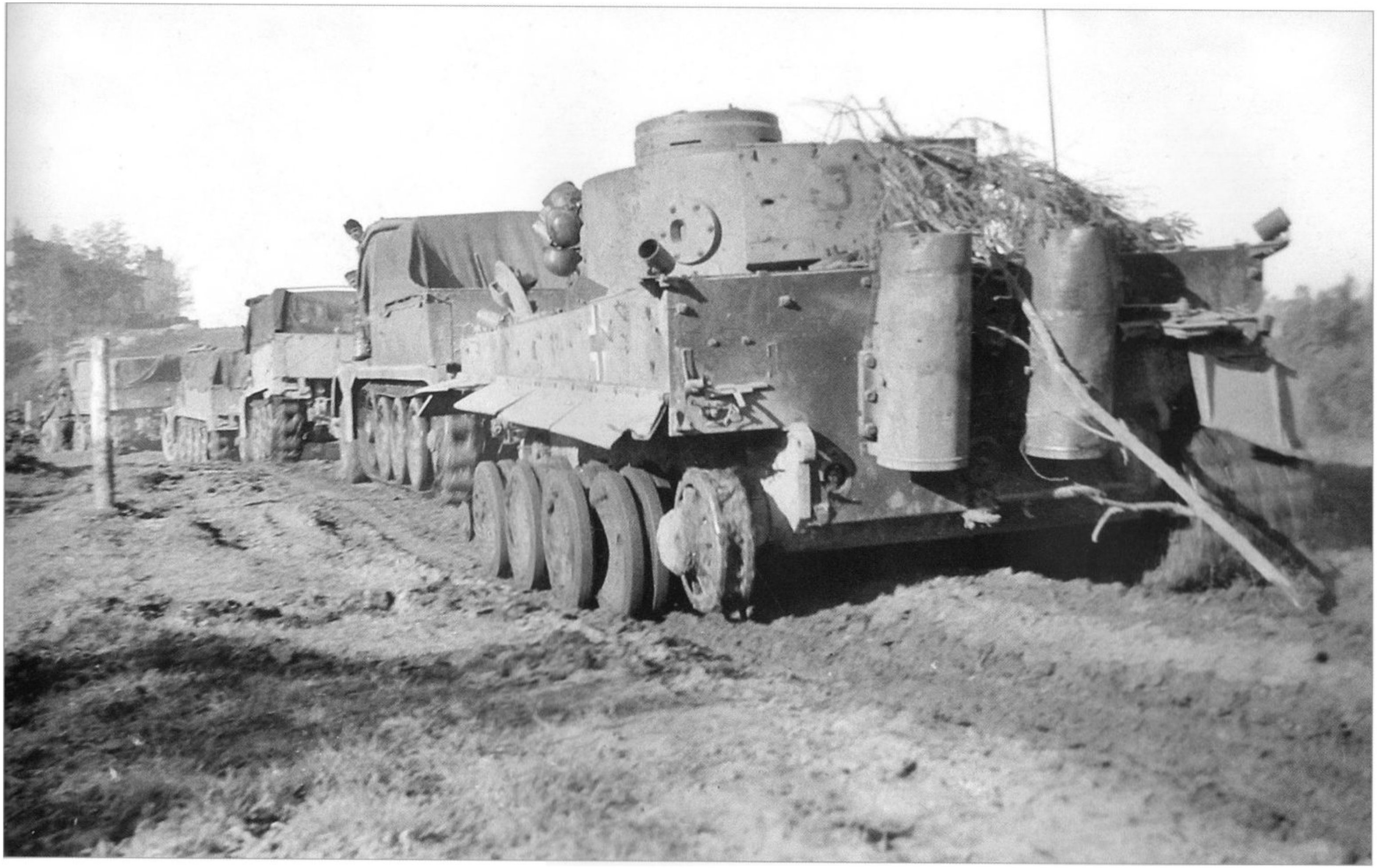
Technical failures and observations:

1. *After modification, 16 Olvar-transmissions showed damage from shifting from fourth to fifth gear.*
2. *11 engines failed because of problems in the carburetors, resulting in 9 carburetor fires. The heat sensors and spray nozzles of the automatic fire extinguisher system were partially destroyed.*
3. *In 20 Tigers due to leakage of the radiator, the oil leaked mostly through the oil filler and dripped on the exhausts in the engine compartment. This can lead to engine fires.*
4. *8 engines overheated due to incorrect ignition- and carburetor settings. The problem could not be spotted in Germany because there was not enough fuel for test and practice drives.*
5. *Exhaust gases are sucked into the fighting compartment when the Tiger is driven in reverse or the wind is from the rear. The crew are greatly hindered by the carbon monoxide gas.*
6. *While reversing, small steering movements led to the tracks being thrown off 6 times. The resulting stretching of the track could be repaired only by torch cutting individual track links.*
7. *Fuel consumption from driving in medium difficult terrain including warming up of the engines and traversing the turret in battle, is 8 - 10 liters per kilometer, not 5 liters.*
8. *Due to burnt propellant gases emerging from the gun barrel and the spent cartridges, strong carbon monoxide gases build up inside the fighting compartment so that the commander's cupola and the loader's hatch must be opened. The ventilator fan is not powerful enough.*
9. *The emergency escape hatch needs to be outfitted with hinges on the side so that it can be opened to communicate with other vehicles or with infantry commanders. With the present location of the hinge, because of its weight, it can only be closed by two men pushing from the outside.*

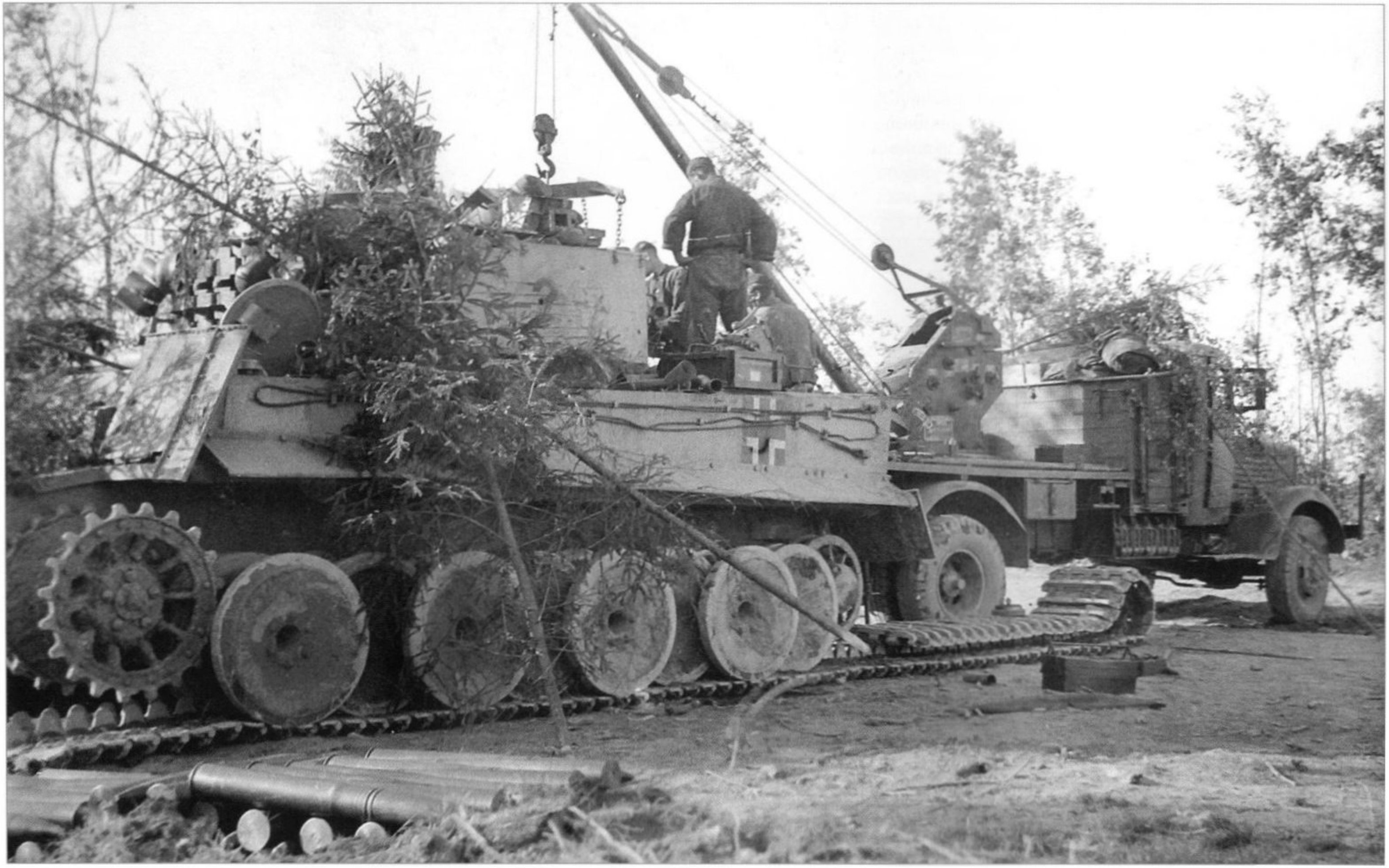
Strains on maintenance:

Because the Abteilung has only 5 Zugmaschinen instead of its allowed 13, and recovering a Tiger in the mountainous terrain requires 3 Zugmaschinen, the broken-down vehicles could only be brought to the Werkstattkompanie slowly. After our request, the Panzer-Bergekompanie 3 of the XXXX.Pz.A.K. stood by with 4 Zugmaschinen on the 26 September 1943.

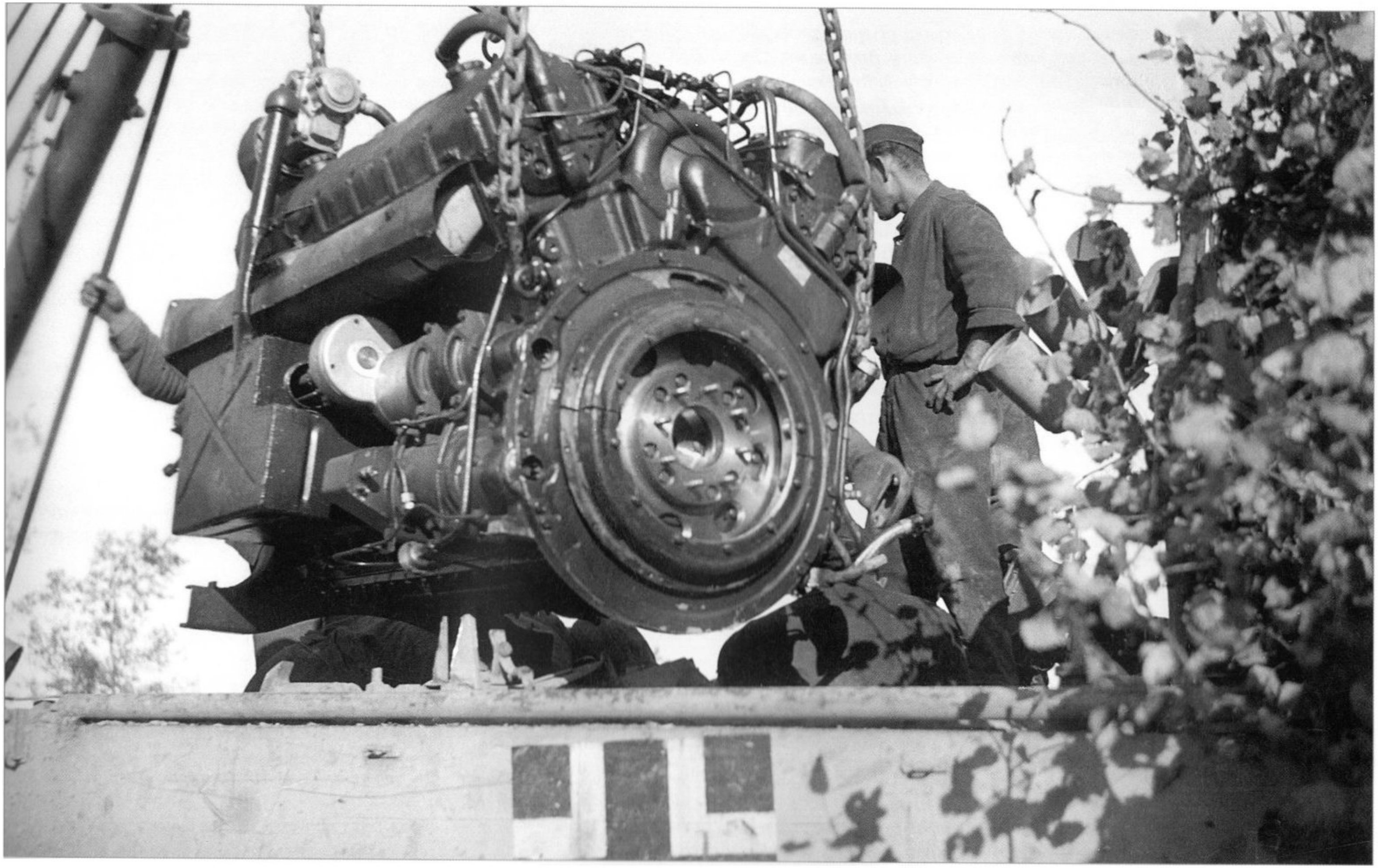
The transfer of the Panzer-Ersatzteillager rearwards from Dnepropetrowak to the vicinity of Berditschew (ca. 600 km beeline)



▲ Four Zgkw.18t are needed to recover this Tiger from 3./s.Pz.Abt.502 in the fall of 1943. The fact that it is not running on its tracks adds more damage to the suspension of the vehicle. But tracks were spare parts sometimes in short supply as well. *AMC*



▲ Another Tiger from 2./s.Pz.Abt.502 in summer 1943. The ammunition has been neatly stacked outside before the work on the engine could begin. Removing the ammo was a mandatory preparation before the Panzer was handed over to the Wkst. *AMC*



▲ The Maybach engine HL 210 or 230 as fitted in Tigers and Panthers. As the Panzers (and, with the blessing of the OKH, the engines) were brought to the front without sufficient testing, they suffered various teething problems. *AMC* *heavily strained the supply of spare parts, and maintenance takes longer than in Germany. Because the Abteilung has been newly created and has only limited experience with Tigers, no spare parts could be stocked. The Werkstattkompanie has been newly created as well, and consists mainly of mechanics who had never worked on a Panzer. Furthermore, all the tool boxes have not been delivered yet. The most important part that is missing is the electric welder, which is crucial to repairing sprung welds.*

Another experience report from s.Pz.Abt.506 as of 1 January 1944 gives further insight on their maintenance activities:

Technical experience report

Damaged arrivals from 20Sep - 31Dec:	*75*
Repaired from 20Sep - 31Dec:	*62*
Sent to the homeland:	
for maintenance from 20Sep - 31Dec:	*6*
Panzers at the Wkst.Kp. on 31Dec:	*7*

The following repairs have been carried out:

Engine:

Due to damage, 39 engines were removed from 20Sep - 31Dec.
The engines had the following problems:

Water in the cylinder:	*10*
Water in the oil:	*9*
Broken connecting rod:	*7*
Heavy oil consumption:	*5*
Valve break:	*3*
Piston jam:	*2*
Lager (bearing) jam:	*1*
Oil pump axle drive shaft broken:	*1*

35 engines were installed from 20Sep - 31Dec, 25 of these were new, five were repaired by the Wkst.Kp., and five were replacement engines. The engines of 25 other Panzers, as far as they did not come to the Wkst. with engine damage, were thoroughly checked. Predominately burnt middle atomizers and broken floaters were found. Since combat ready engines have been installed, the burning of middle atomizers decreased to a minimum.

Olvar Transmission:

Transmission failures from 20Sep - 31Dec: 25
16 Tigers needed the transmission removed which required lifting off the turret.

The transmissions had the following problems:

Broken shifting claw:	*11*
Clutch damage:	*3*
Lager (bearing) damage:	*1*
Cone impulse damage (Kegelantrieb):	*1*

15 transmissions were installed. 11 of those were repaired by the workshop company, four were new. Four transmissions were sent to the homeland.

Steering gear:

Transmission damage from 20Sep - 31Dec: 16
3 Tigers needed the transmission removed which also required the lifting of the turret. These steering gears had their radius clutch damaged.
3 other steering gears were losing oil and 10 needed their telecin shafts refurbished.

Suspension:

Suspension damage from 20Sep - 31Dec: 60
Out of these, 30 were heavily damaged by shelling.

The following repairs were carried out:

Exchange of the idler crank and track tensioner:	*5*
Idler replaced:	*9*
Rear interlocked crank removed:	*4*

These works required a removal of the engine:	
Smooth crank removed:	*15*
This required the removal of 162 road wheels:	
Exchange of road wheels and wheel bodies:	*60*

Damaged track tensioners: 11

In these 11 cases, with the tracks tight, the track tension spindle on the left touched the bumper and dented it. It had to be shortened by 20 millimeters.

Torsion bars exchanged: 1

Final Drive:

Damage from 20Sep - 31Dec: 41

The following repairs were carried out:
Drive train replaced: 9
Drive trains refurbished: 3
Drive trains sealed: 12
Gear rim of the sprocket replaced: 24
Sprocket replaced: 10

The exchange of the sprocket gear rims was, except for a few instances, due to mounting screws being torn off by shelling. The workshop manufactured better replacements which led to better performance.

Cooling system:

Damage from 20Sep - 31Dec: 28
The following damage occurred:
Leaking radiator and connections: 18
Radiator and radiator impeller: 10

8 new radiators were installed and 5 were repaired by soldering. The damages can be traced back to shell fragments.

Brakes:

Damage from 20Sep - 31Dec: 14
Brakes adjusted: 12
Brakes replaced: 2

Welding:

Larger welding work from 20Sep - 31Dec: 41

In 5 cases the 'Schutzbügel' had to be welded on the final drive; the damage occurred from shelling.

28 shell holes were covered with steel plates.
1 penetration in the turret (120mm) and 1 in the cooling system (100mm) were covered with custom made steel stoppers.
2 cracked weld seams (300-400mm) at the front were repaired.
35kg of nickel-electrodes were used.
Smaller welding work is not listed here.

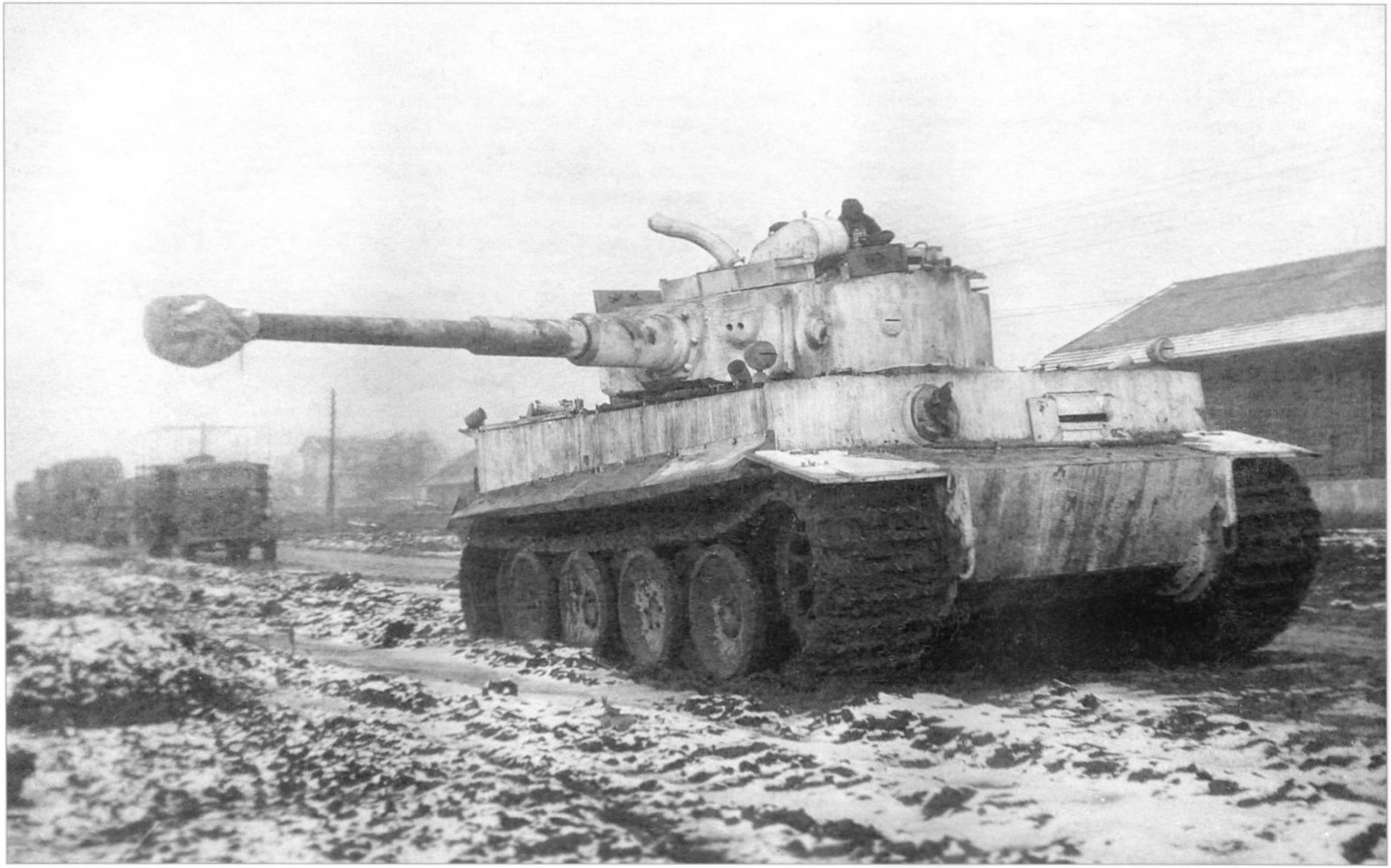
Weapon damage:

For the following repair work the turret needed to be lifted (40 Panzers in total from 20Sep - 31Dec):

Item	Technical Nature	Caused by Enemy
Gun barrel replaced	...	6
Mantlet replaced	...	3
Turret replaced	...	2
Muzzle brake replaced	...	1
Elevating gear repaired	6	...
Traverse gear repaired	3	...
Cupola repaired	...	12
Visors replaced	2	3
Ammo racks replaced	7	6
Hydraulic drive, fluid renewed	12	...
Hydraulic drive control repaired	5	...
MG mounts repaired	...	9
Hatch lids repaired	...	4
Firing mechanism replaced	4	...
Recoil brake repaired	2	...
Turret traverse mechanism repaired and checked	27	...

Radio:

Damage:
Intercom box for Pz.Kpfw.VI No. Pz. 20 30



▲ An unidentified Tiger with its engine hatch open and parts of its 'Feifel' air filters removed. It already has the new tracks with chevrons as introduced in Oct43. The 'Feifel' filters were officially discontinued in Oct43. *JH*

Earphones:	*7*
Slip ring transmitter:	*6*
Throat microphone:	*5*
UKW receiver:	*5*
Sending converter:	*4*
Receiving converter:	*3*
10 watt sender:	*1*

Of the 30 damaged intercom boxes, 13 condensers, 9 relays, 4 tubes and 4 resistors were damaged. In all cases the cause was shock. It could be helped to a certain extent by installing rubber bases.

Back to the III. Abteilung (Tiger) Panzerregiment Grossdeutschland on 31 August 1943 (see page 45): Of the six Tigers which arrived in Poltawa for the Abteilung from Germany, only one was operational after a march of 45km. The reasons were as follows:

Fgst.Nr. 250 295; Motor-No. 61 047; Marching distance 45km
4 atomizer nozzles melted. Membrane pump not set on full capacity. Tachometer spiral broken. Radio and intercom defective. MG cannot be mounted. Lock washers for suspension, screws for combat tracks were missing. Left fan drive? had no oil.

Fgst.Nr. 250 368; Motor-No. 61 133; Marching distance 45km
Engine had much too advanced ignition, kicks back when turned off. 3 atomizer nozzles melted. 1 floater soldered off ('losgelötet'). 3 screws for jackshaft, transmission and final drive were missing which resulted in a destroyed brake. Screws broke off.

Fgst.Nr. 250 381; Motor-No. 61 169; Marching distance 45km
Several lock washers and screws for the suspension (combat tracks) were missing. Safety lock for main gun not installed. Driver's and radio operator's hatches could not be closed.

Fgst.Nr. 250 390; Marching distance 8km
Clutch damage (support pressure 5.5 Atü does not disappear). Shift collar stuck in transmission. Left radiator no oil.

Fgst.Nr. 250 379; Motor-No. 61 222; Marching distance 45km
Loses oil from radiators. Safety lock for main gun is missing. Fuel pipe from three way valve is leaking. 3 middle carburetors melted. 1 float gauge unsoldered ('losgelötet').

Fgst.Nr. 250 383; Motor-No. 61 197; Marching distance 45km
Carburetor seal missing. Fuel line on three way valve leaking. 2 atomizer nozzles melted.

As a consequence of the aforementioned damage, 4 of the new Tigers had to be brought to the Werkstatt immediately. The Panzers were picked up at Poltawa station by experienced crews.

Three last reports shall give some more reasons for the decline in the operational availability of a heavy tank battalion. The first two come from the short evaluation that the commanders of s.Pz. Abt.503 wrote at the end of their monthly reports. The last one is an opinion expressed by a former member of s.Pz.Abt.506.

1 September 1943:

As a result of long marches and constant action, 50% of the vehicles are operational. Personnel-wise fully ready. Two urgently needed (and by order of H.Gr. South from 9 August 1943 already assigned) Werkmeister (1 transmission and 1 engine specialist) have not yet arrived. Losses normal, with the exception of the officers. Clothing and provision situation good. Spare parts situation for Panzers satisfactory, for wheeled vehicles it is strained. Mood of the troops good.

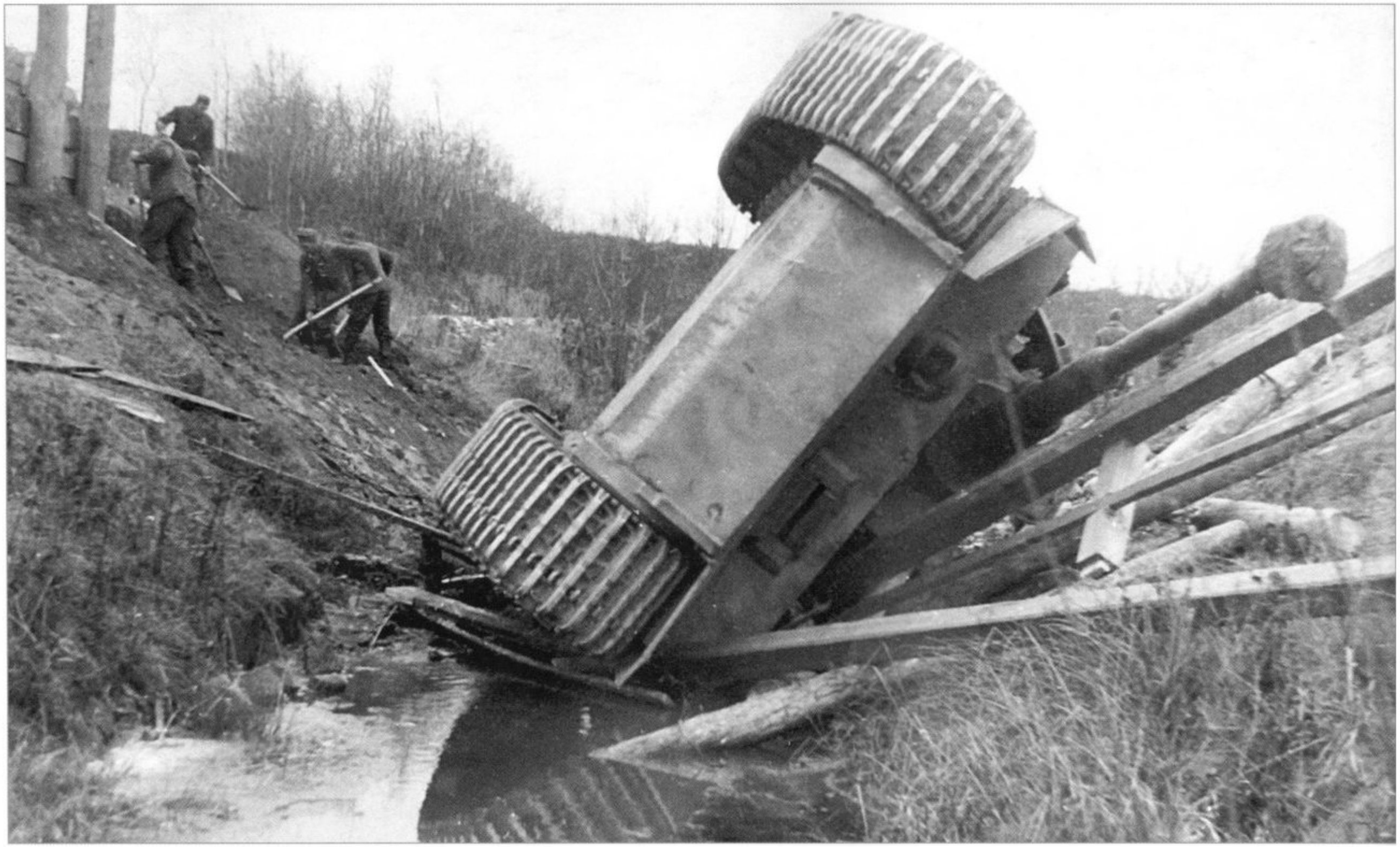
1 January 1944:

Due to several deployments, the replenishment had no effect yet. The announced 45 Tigers have not yet arrived. Of the wheeled vehicles, barely 50% are operational which at the time is in no way sufficient to supply 45 Tigers. Only 1/3 of the Zugmaschinen are operational. The lack of recovery means is especially noticeable in winter.
The bad Kfz. situation will be completely resolved once spare parts have arrived.
After the arrival of replacements, the personnel situation is

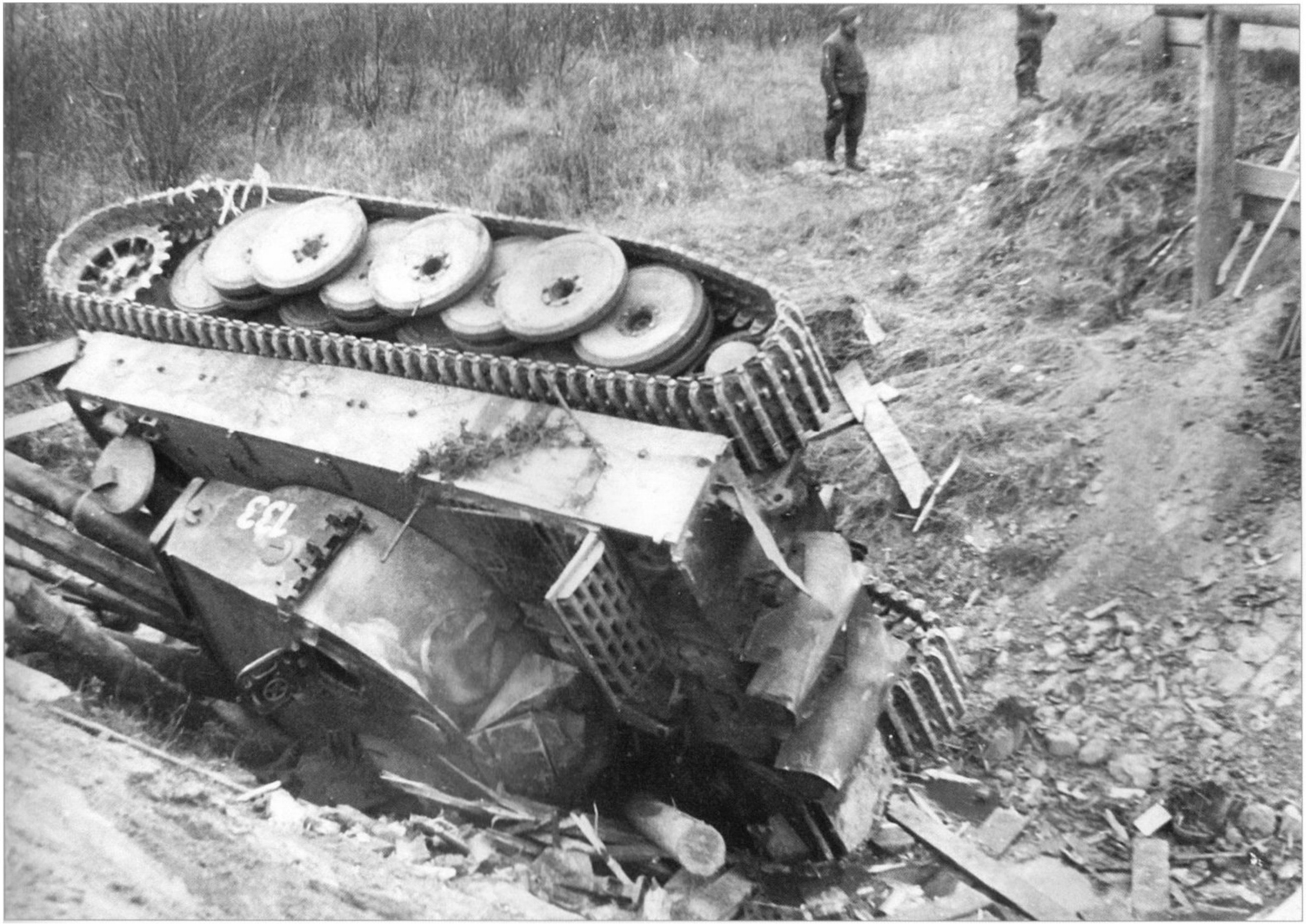
> *sufficient.*
> *Training level good. Provisions and health good. Winter clothing sufficient. [Regular] clothing, due to enemy action and the loss of a replacement delivery, not sufficient.*
> *Mood good.*

As a POW, Spannagl, a former member of s.Pz.Abt.506, gave the opinion that 20% of break-downs were due to inferior material, 50% due to bad oil and 30% due to insufficient run-in of the engines.

Complaints about the oil have also been found in other places. However, in AHM No. 52, dated 29 May 1942, it is stated that engines of Pz.Kpfw, Sturmgeschützen, Selbstfahrlafetten, Zgkw., Schützenpanzerwagen and diesel vehicles from new production do not need to be run-in, because these engines were run on the test-rig.



The following series shows Tiger '133' from s.Pz.Abt.502 which broke through a bridge near Pustoshka on 23 November 1943, killing the commander Uffz. Knapp. His Tiger has a number of incompatible features, suggesting that original parts have been replaced. On the turret, the mantlet is not reinforced, track links are stowed but there is no loader's vision device in the turret roof. *AMC*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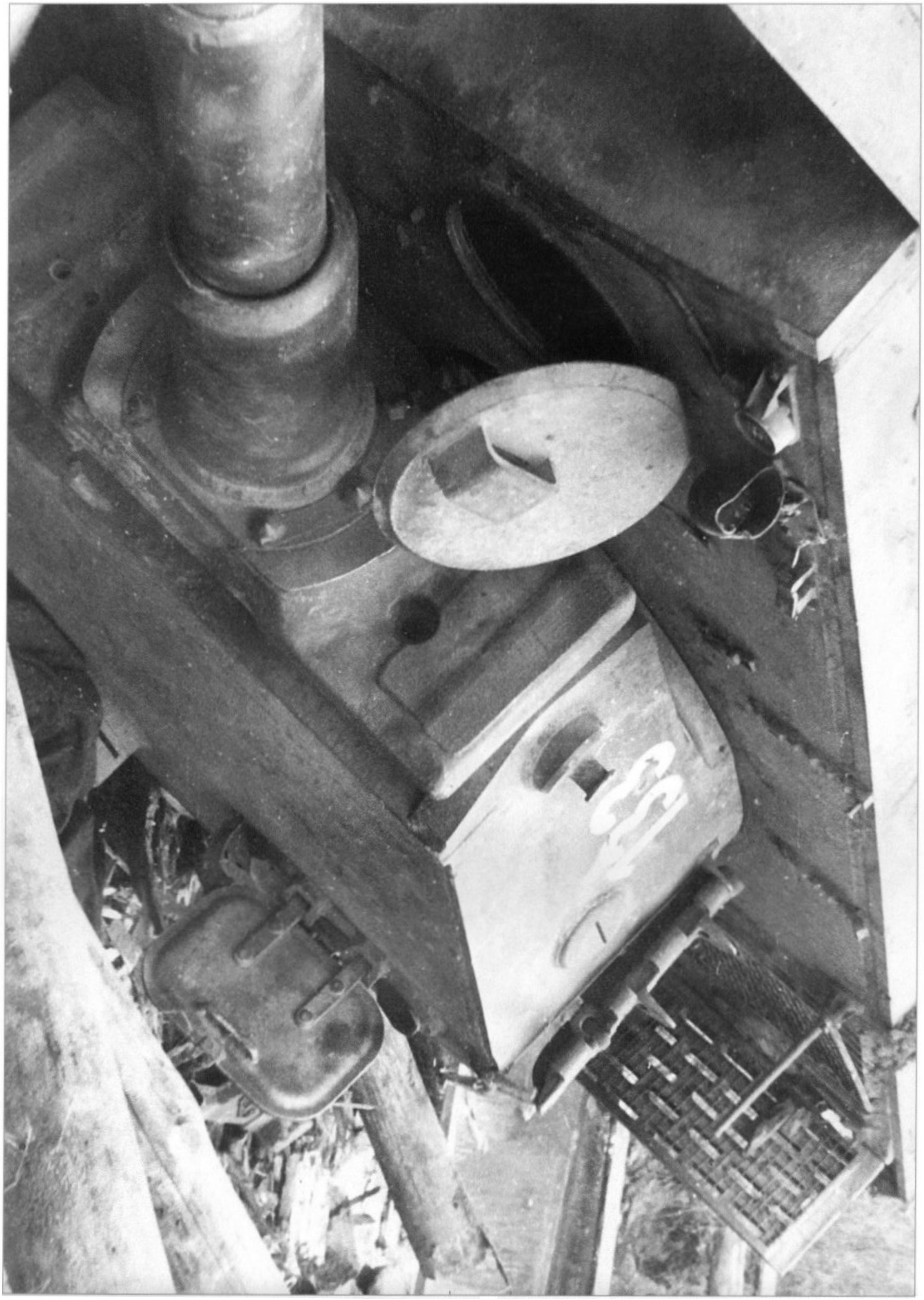
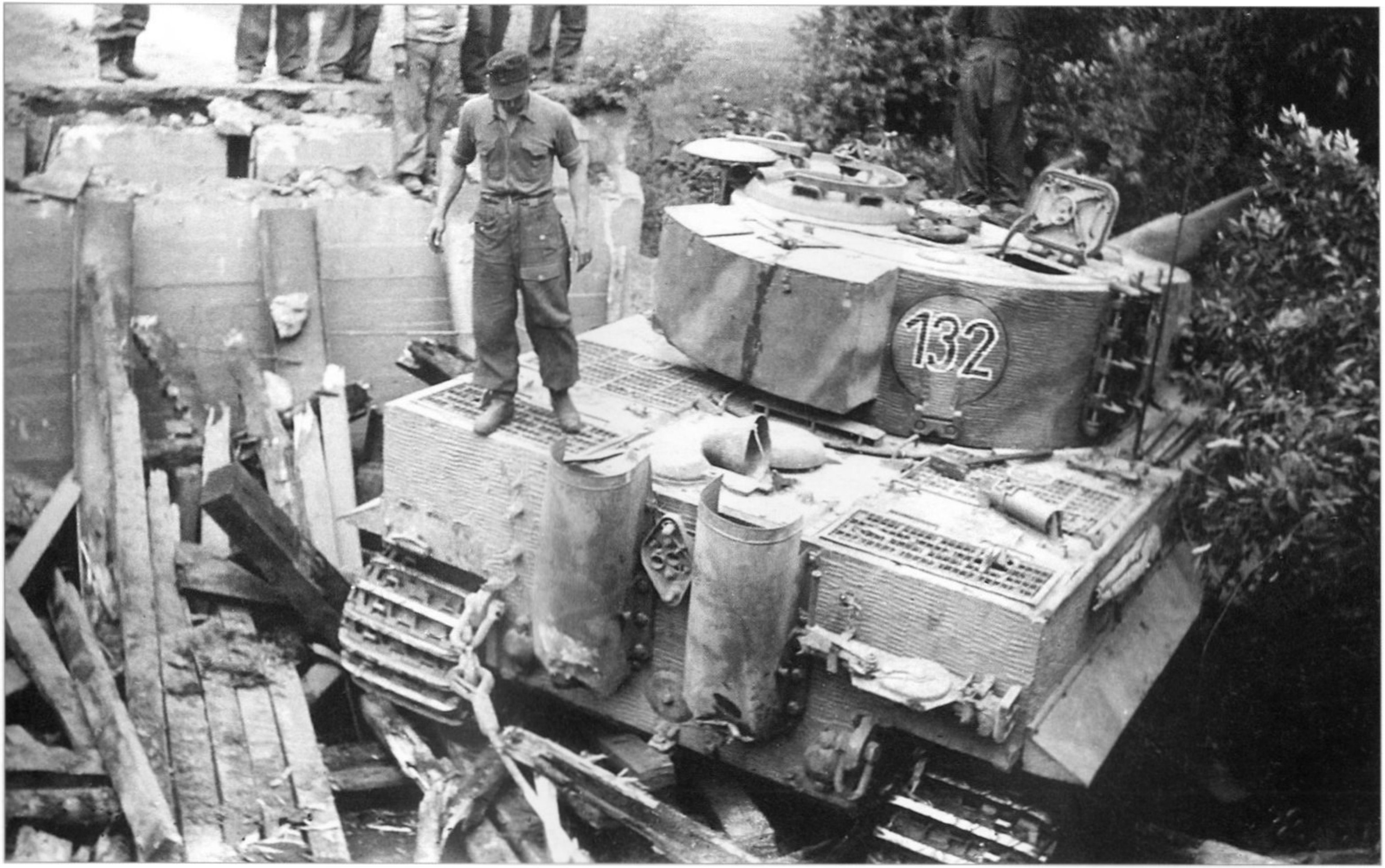
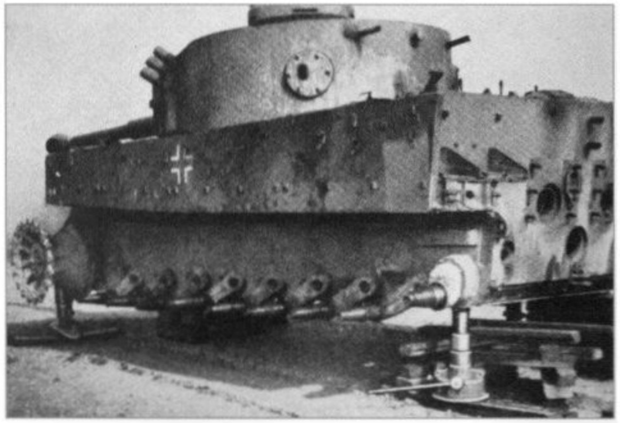
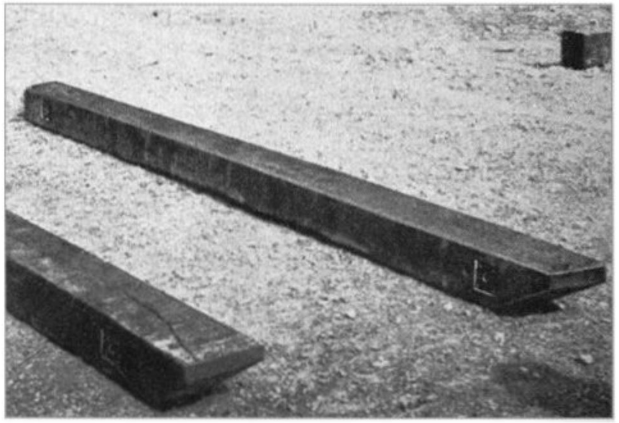
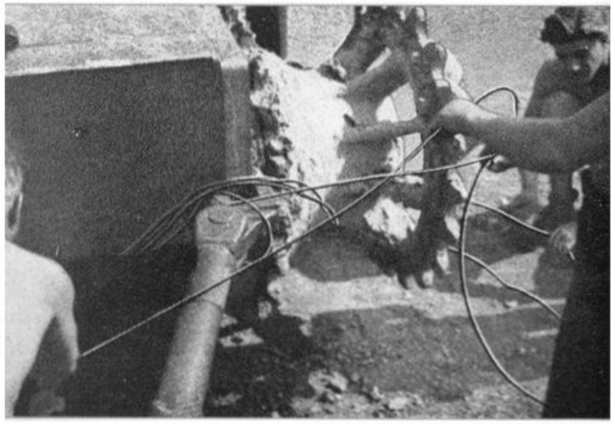


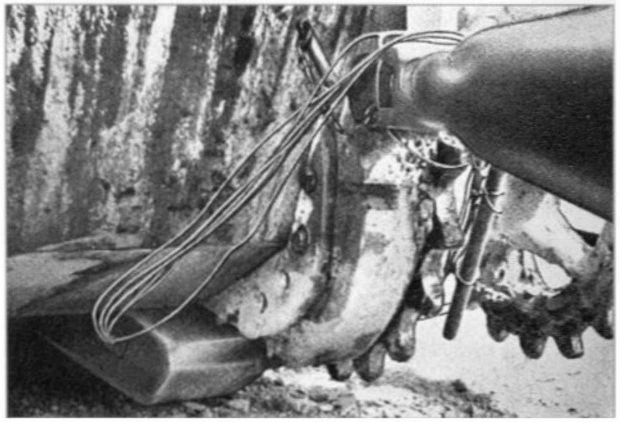


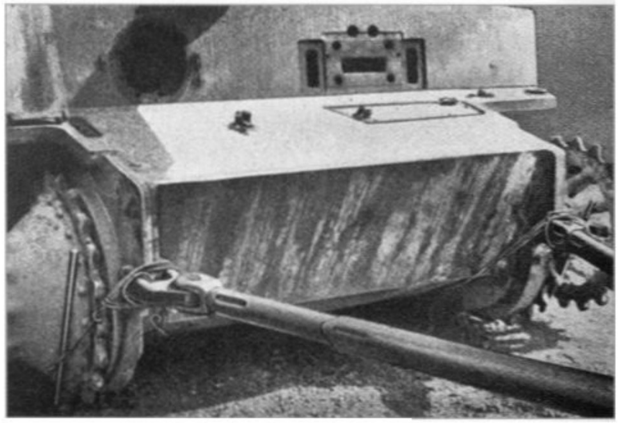
▲ This Tiger belongs to s.Pz.Abt.510 which fought in Lithuania, East Prussia and Courland in the North of the Eastern Front. Apparently, weak bridges posed a constant threat to the Tiger's movement. *AMC*

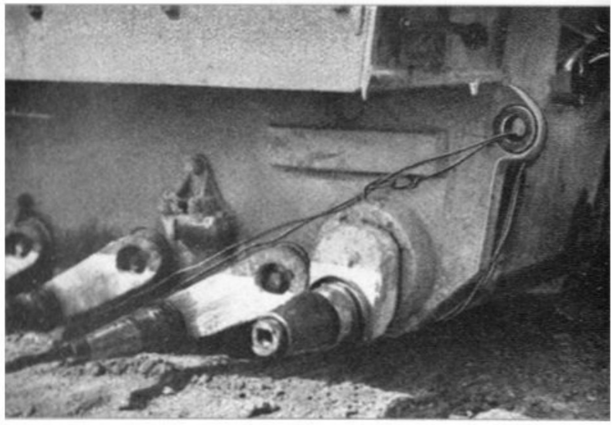


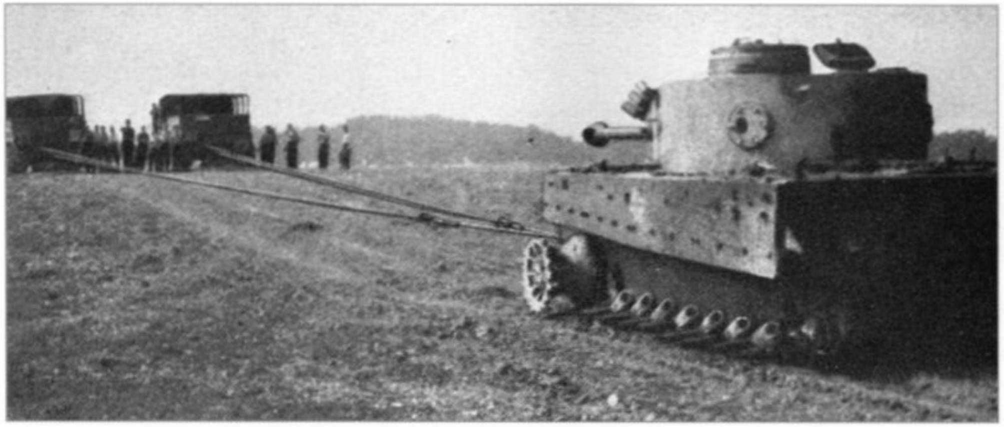


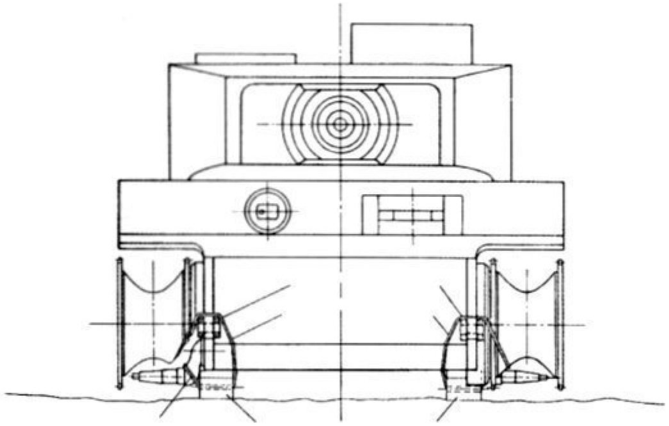


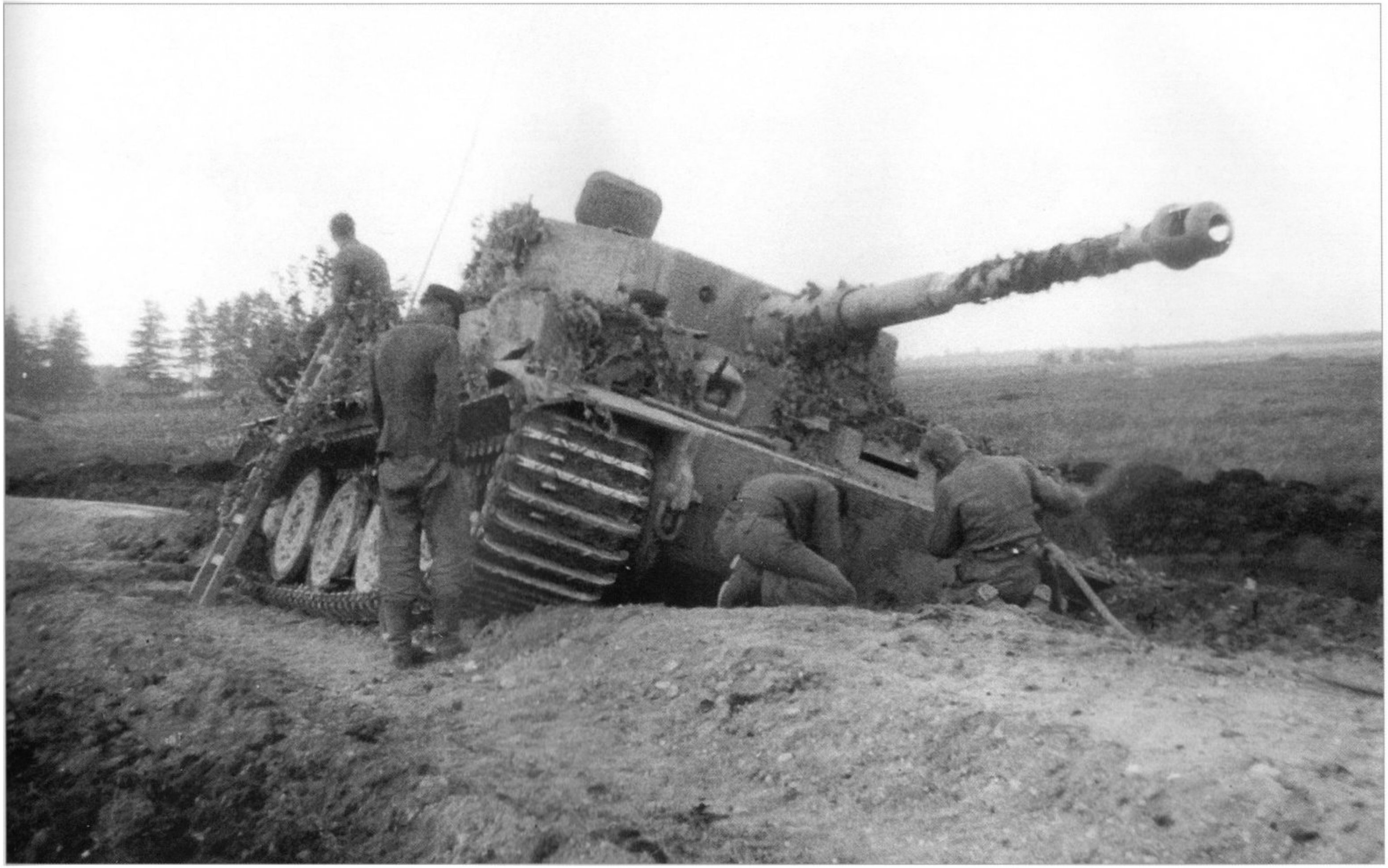






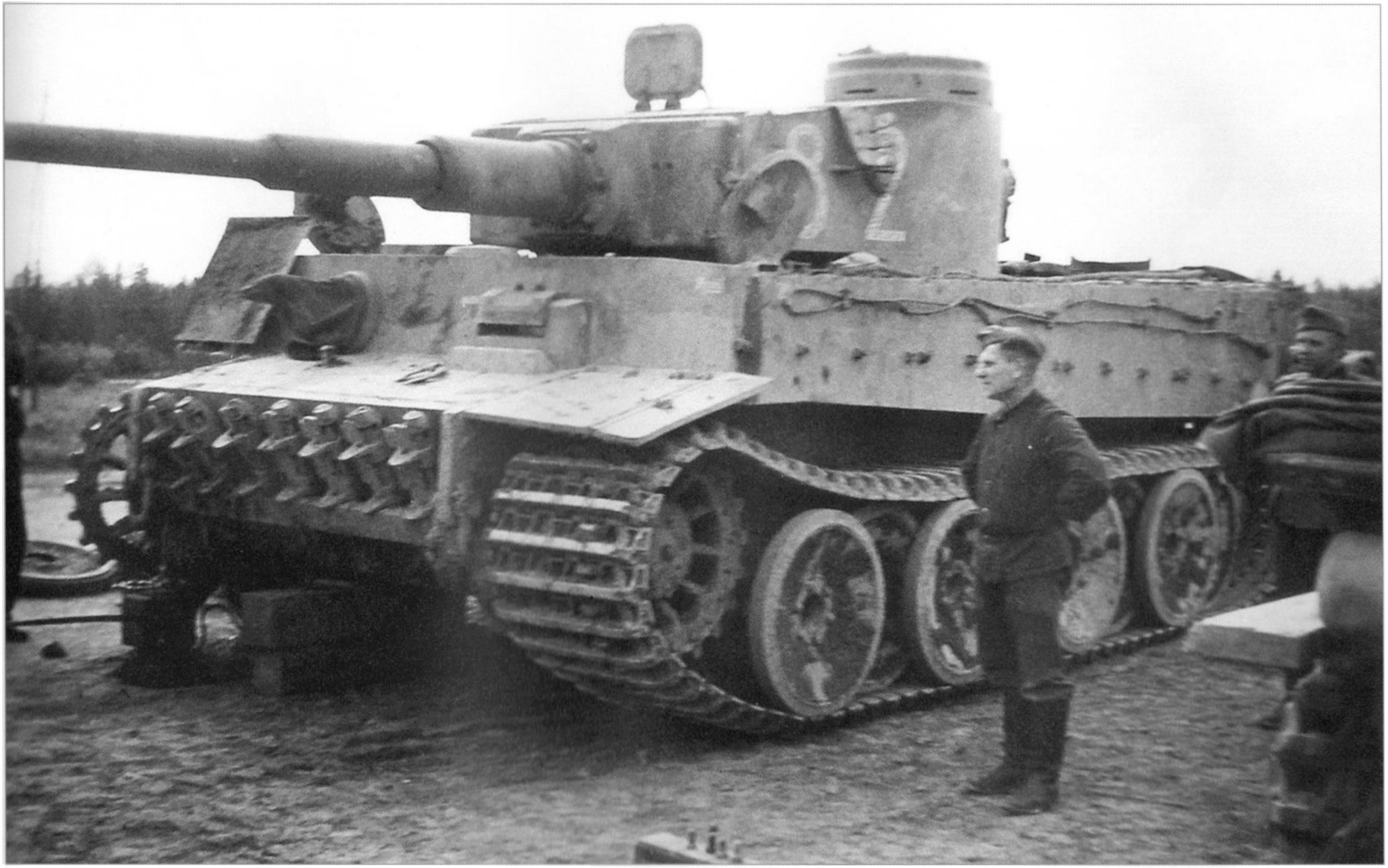






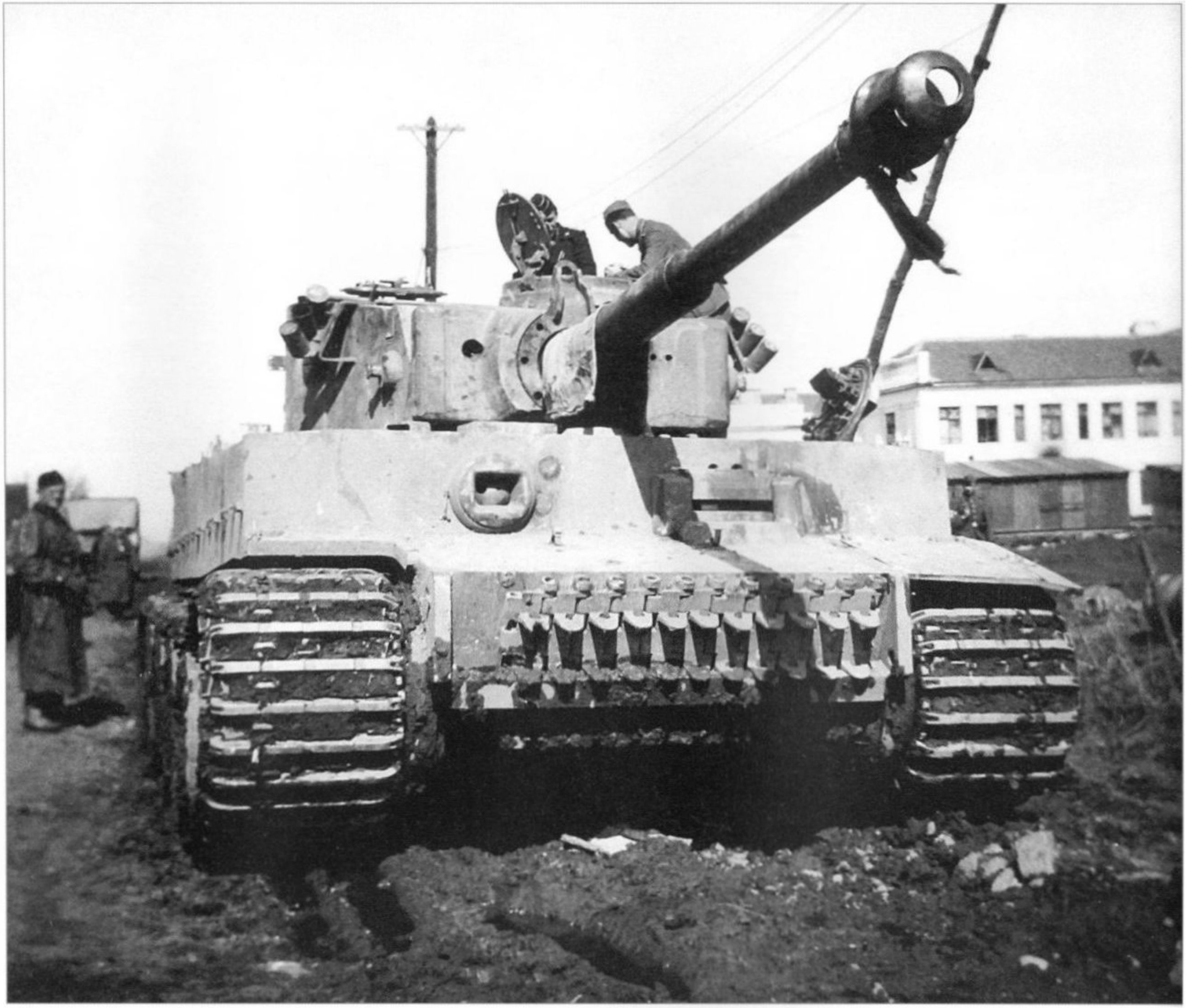
◀ These pictures from the recovery manual show how an immobile Tiger had to be recovered on beams of 5m in length, 20cm in height and 24cm wide. The wire tightened when the Zgkw. started pulling the recovery bars.

▲ Mine damage? The features of Tiger 'C23' (steel-tired road wheels and cut hull side extension in the front) indicate that it was produced in early 1944. This letter/number combination was introduced in Aug43 and was unique to III./Pz.Rgt.GD. *AMC*

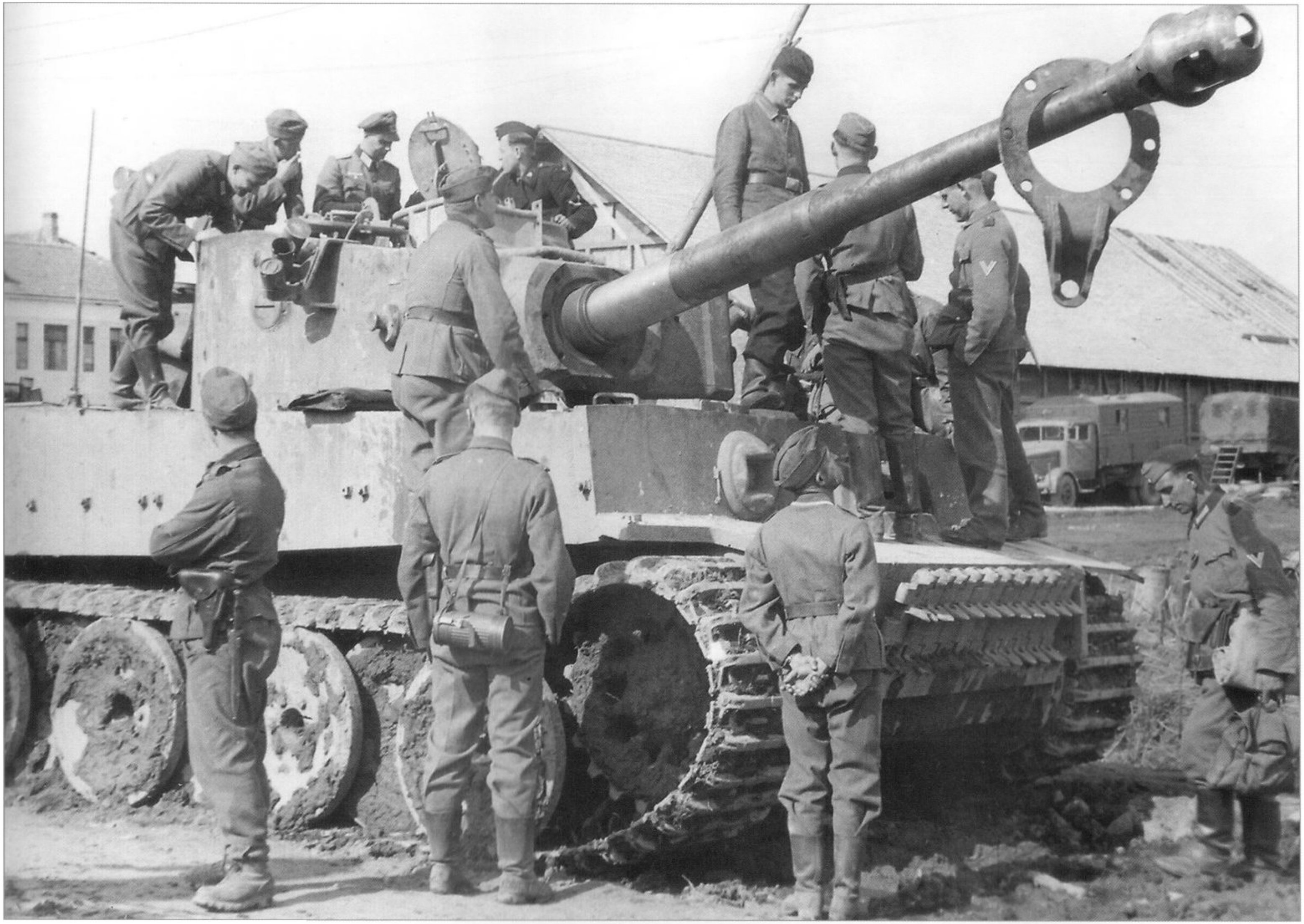


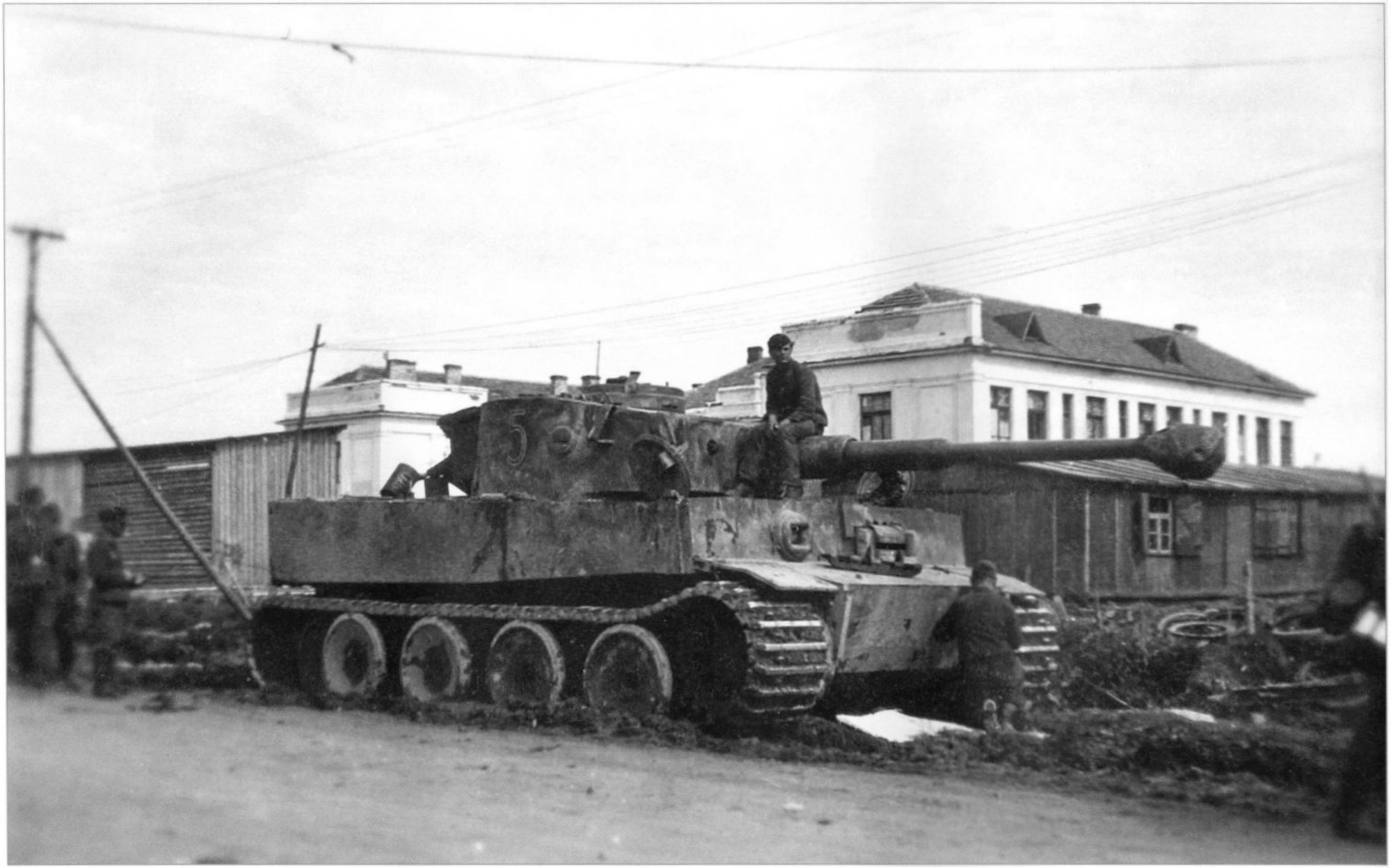
◀ An early production Tiger I issued to 1./s.Pz.Abt.502 in December 1942. It carries the turret number '32' in large white digits as used by the Abteilung for a short period in the Spring of 1943. *AMC*

▲ Spare track links are stowed on the bow, a field modification which is rarely seen in the Abteilung. The Tiger carries the nickname 'Anni,' who was probably the driver's girlfriend. Fitted centrally on the turret rear is a bin from a Pz.Kpfw.III. *AMC*



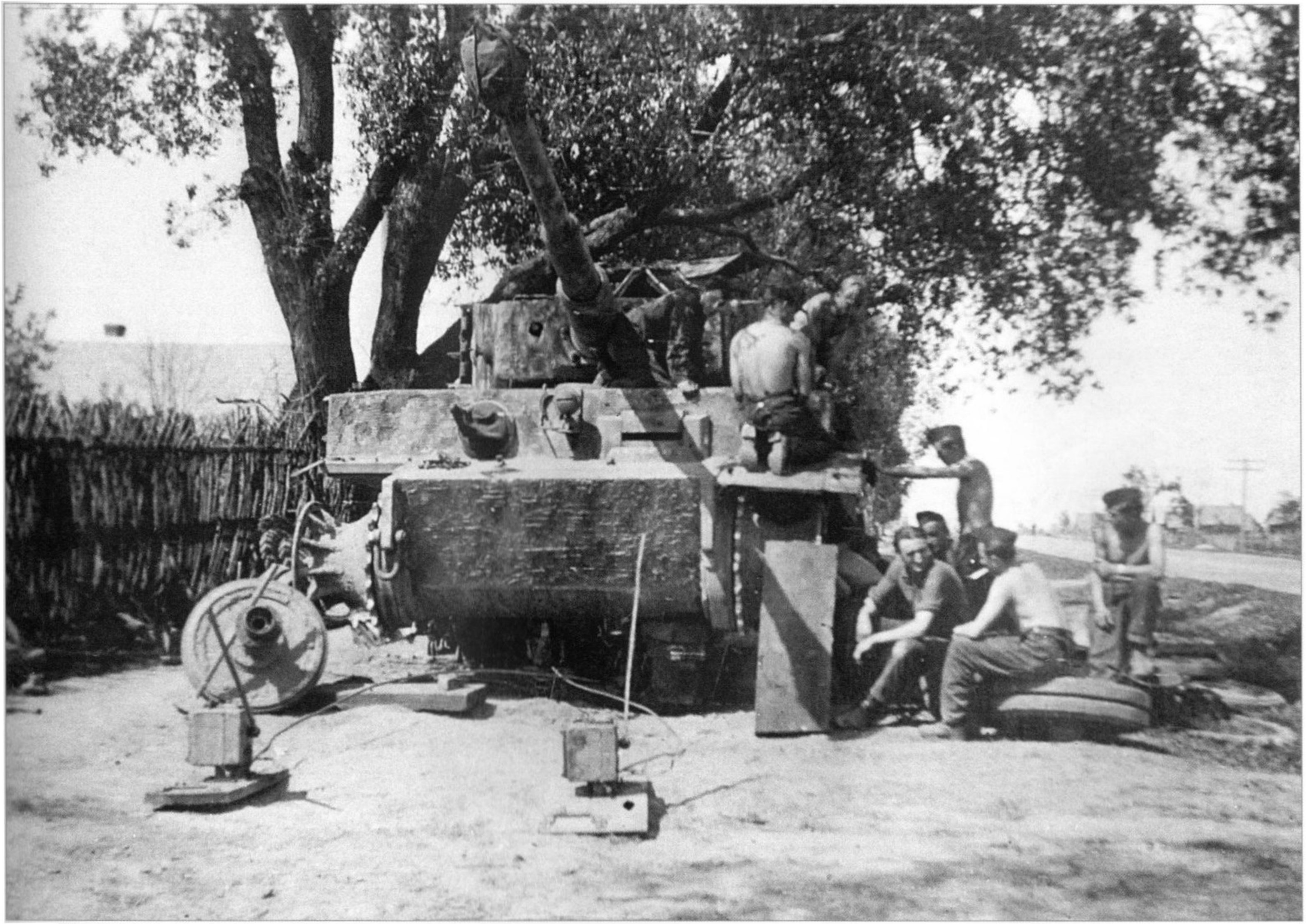
Tiger No.'4' of 1./s.Pz.Abt.502 in spring 1943. There exists another view of this hull though the mantlet differs, suggesting a different turret is in place, a result of making serviceable tanks out of several broken ones. Bolted to the mantlet is a device used to remove and lift the main gun and mantlet. However, nothing more is known about it nor has it been seen in other photos. *AMC*

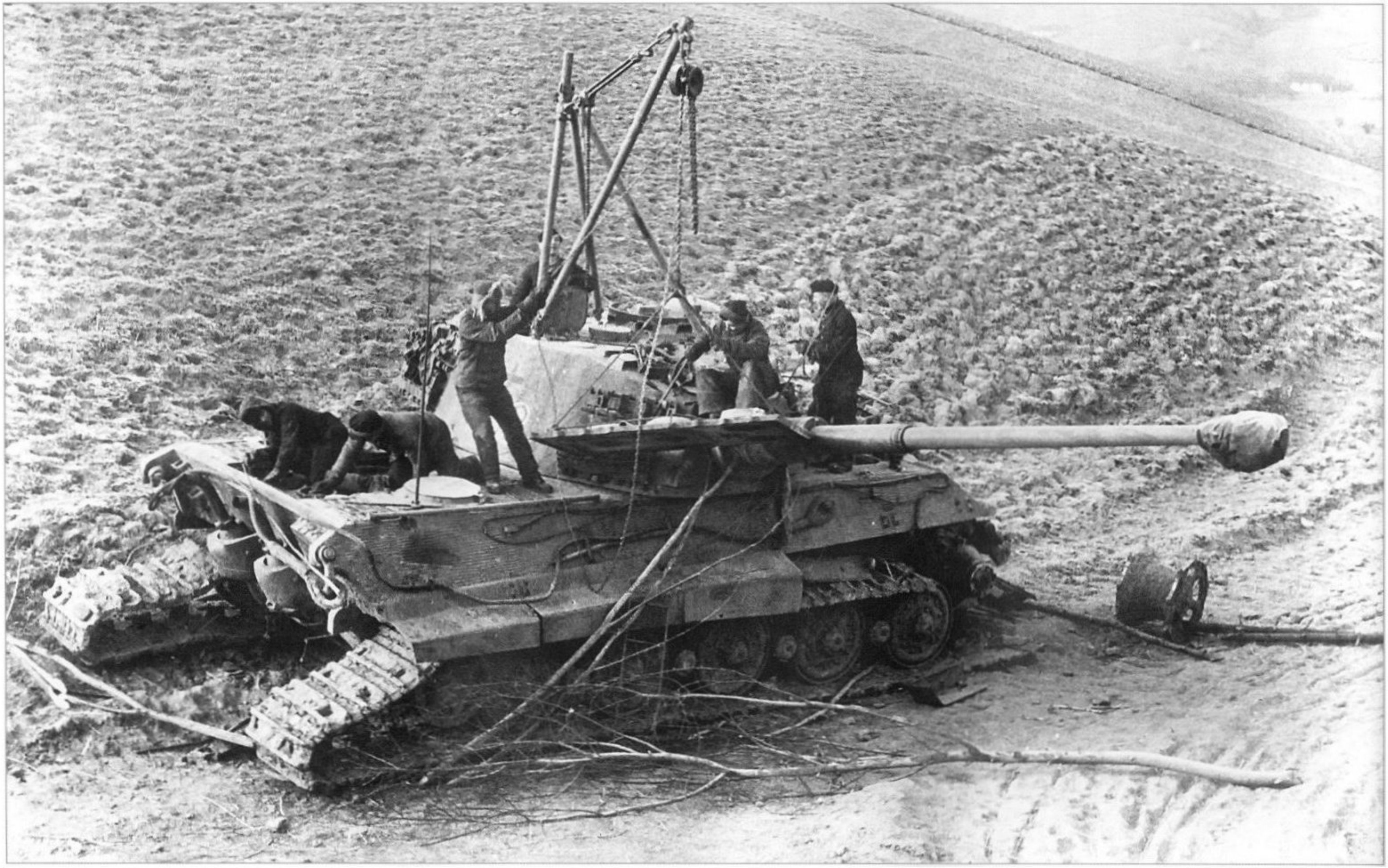




▲ Another view of Tiger No.'5' from s.Pz.Abt.502 from early 1943, as featured on the cover of this book. The hull with the distinctive patch could also be seen carrying the turret with the No.'2'. It is at the same location as seen on the previous pages. *AMC*

▶ Suspension work was notoriously time consuming even for a well practiced crew. Note what we think are two hydraulic jacks in the foreground and the little roof over the comander's cupola. *AMC*



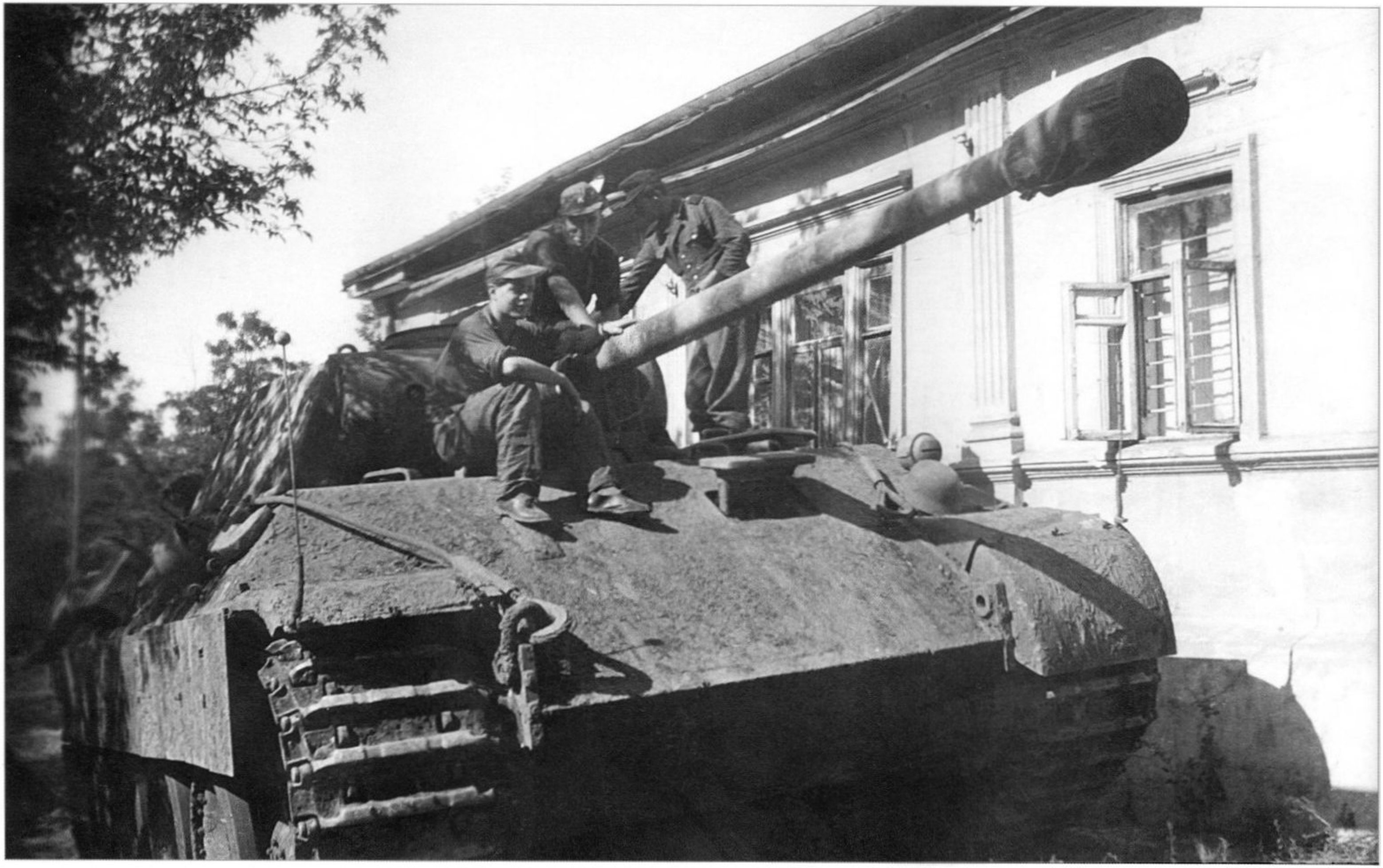


▲ It is very rare to see the 2to jib-boom crane in action since it only started to be issued to the troops in June 1944. Here it is used on a s.Pz.Abt.501 machine.
Bundesarchiv-Bildarchiv with Foto Nr. R 65 913 (from Potsdam)

Maintaining the Panthers

3

A Regular 'Newbie' 79
Definitely Grown-Up 85



▲ Strange things happen in the field. The vehicle width indicators on this Panther have sprouted up like corn stalks, and the 'Zimmerit' coating looks more like shovelfuls of dirt thrown onto a tacky surface. The young Panzerman enjoys the fresh air. *JH*

A Regular 'Newbie'

The deployment of the first new Pz.Kpfw.V during Operation 'Zitadelle' in July of 1943 is widely viewed as a failure. A look behind the scenes might change this judgment.

After returning from an inspection of the front, the Gen.Insp.d.Pz. Tr., Guderian, sent the following words to General Zeitzler, Chef des Stabes/OKH, dated 17 July 1943:

> *On the evening of 11 July, 38 Panthers were operational, 31 were total write-offs and 131 were in need of repair. A slow increase in the combat strength is observable. The large number of losses by hits (81 Panther up to 10 July) attests to the heavy fighting. The deep, heavily mined, main battlefield of the Russians must result in above average losses of material through hits and mines. The fact that the Panther appeared for the first time on the battlefield focused general interest. Comparisons against losses of other Panzer units were not made. Therefore, the high command and troops quickly jumped to the conclusion that the Panther is worthless.*
>
> *In closing, it should be remarked that the Panther has been proven successful in combat. The high number of mechanical breakdowns that occurred should have been expected since lengthy troop trials have still not been accomplished. The curve of operational Panthers is on the rise. After correcting deficiencies in the fuel pumps and the engines, the mechanical breakdowns should remain within normal limits. Without consideration of our own mistakes, the disproportionately high number of losses through enemy action attests to especially hard fighting.*

According to the Generalinspekteur, one of the main reasons for the relatively high combat losses during Operation 'Zitadelle,' besides the technical breakdowns, was that:

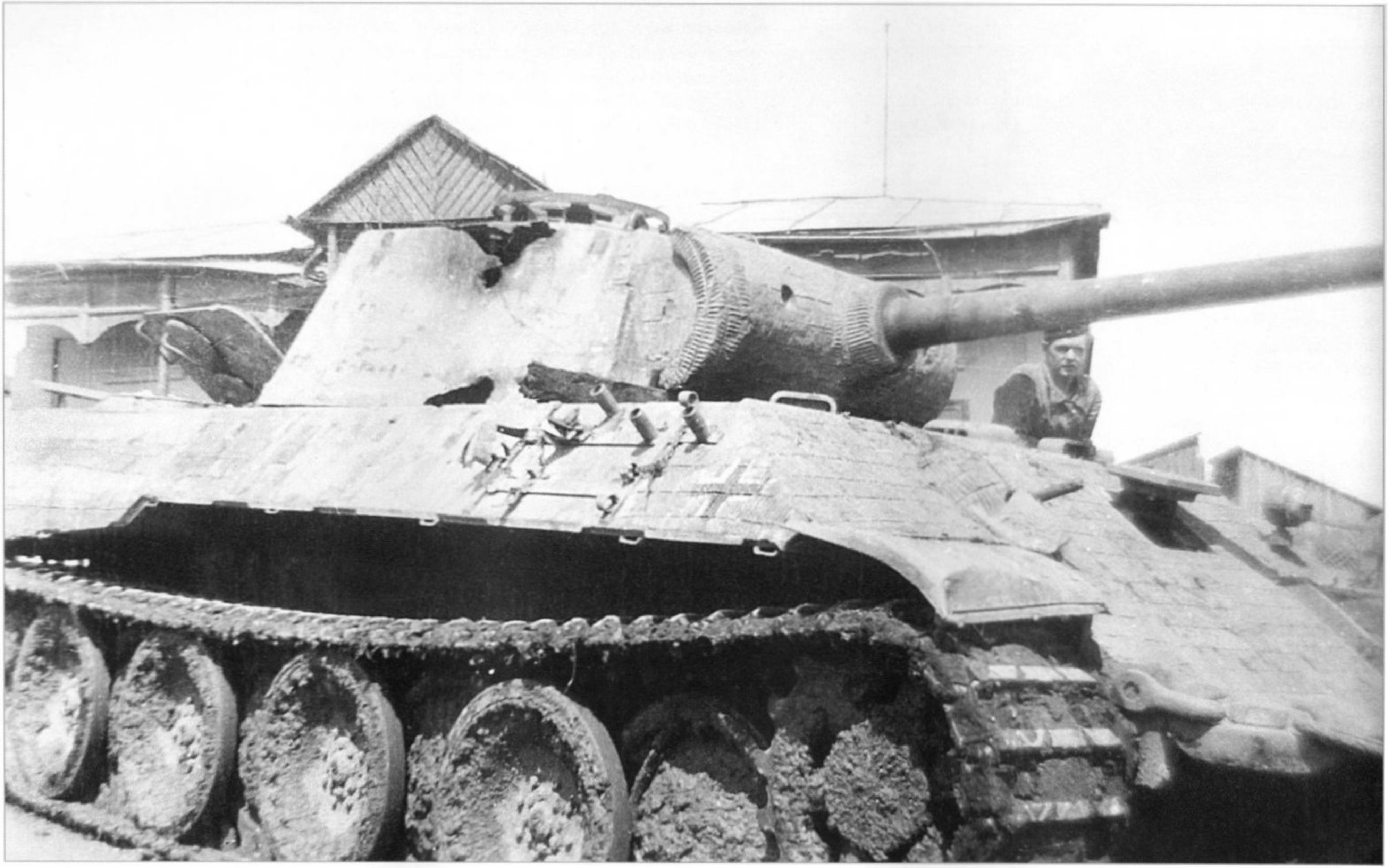
> *The time allotted for training was too short. Therefore, the drivers did not achieve the necessary proficiency. The maintenance personnel were not sufficiently trained. The gunners and commanders did not receive the necessary tactical training. Due to necessary rebuild work at Grafenwöhr, training exercises were only accomplished at the platoon level. The lack of training was very noticeable indeed. A large part of the technical and tactical losses are traceable to this cause.*

The insufficient training was also described after the war by Martin Lange, a Panzerwart in the I-Gruppe of 4./Panzer-Abteilung 51:

> *Training on the Panther was more than inadequate. Non available training material and unschooled teachers resulted in only 60% training on Panther and the rest on Panzer IV. After receiving the Panther we had a short driver training period. Then started the big modification program on the Panthers in Grafenwöhr in which we all participated. All the modifications had to be made under time pressure. The crew had no Panzers nor did they get live fire training. Unit training was not performed either."*

Furthermore, at least at the beginning, the Panthers were not well deployed (fighting at too close range and missing flank protection) and commands were not properly given or not given at all. Because of bad and stubborn leadership during the first main attack in Operation 'Zitadelle', the Panthers milled around in an area of 2 square kilometers in front of a mine field, all within the reach of enemy fire instead of pulling back immediately and attacking in another sector. Remember, Panther (and Tiger) units were not elite units. The crews were not chosen because of their prior achievements. Whether somebody ended up in an independent Tiger Abteilung often simply depended on his being in the homeland at the time such a new unit was formed.

The following 4.Pz.AOK., O.Qu.Abt.V reports on the status of the Panthers of Panzerregiment 39 reveal that most of their total losses did not occur until after the general retreat of H.Gr. South was forced by the Russian counter offensive starting on 3 August 1943. Up till 31 July 1943, the regiment received 12 replacement Panthers from Germany.



▲ The Panther was easier to penetrate from the side than the Tiger I. The hits to the turret side of this Panther under tow chipped off large parts of the 'Zimmerit.' Notice the muddy suspension compared to the dry surfaces of the rest of the tank. *AMC*

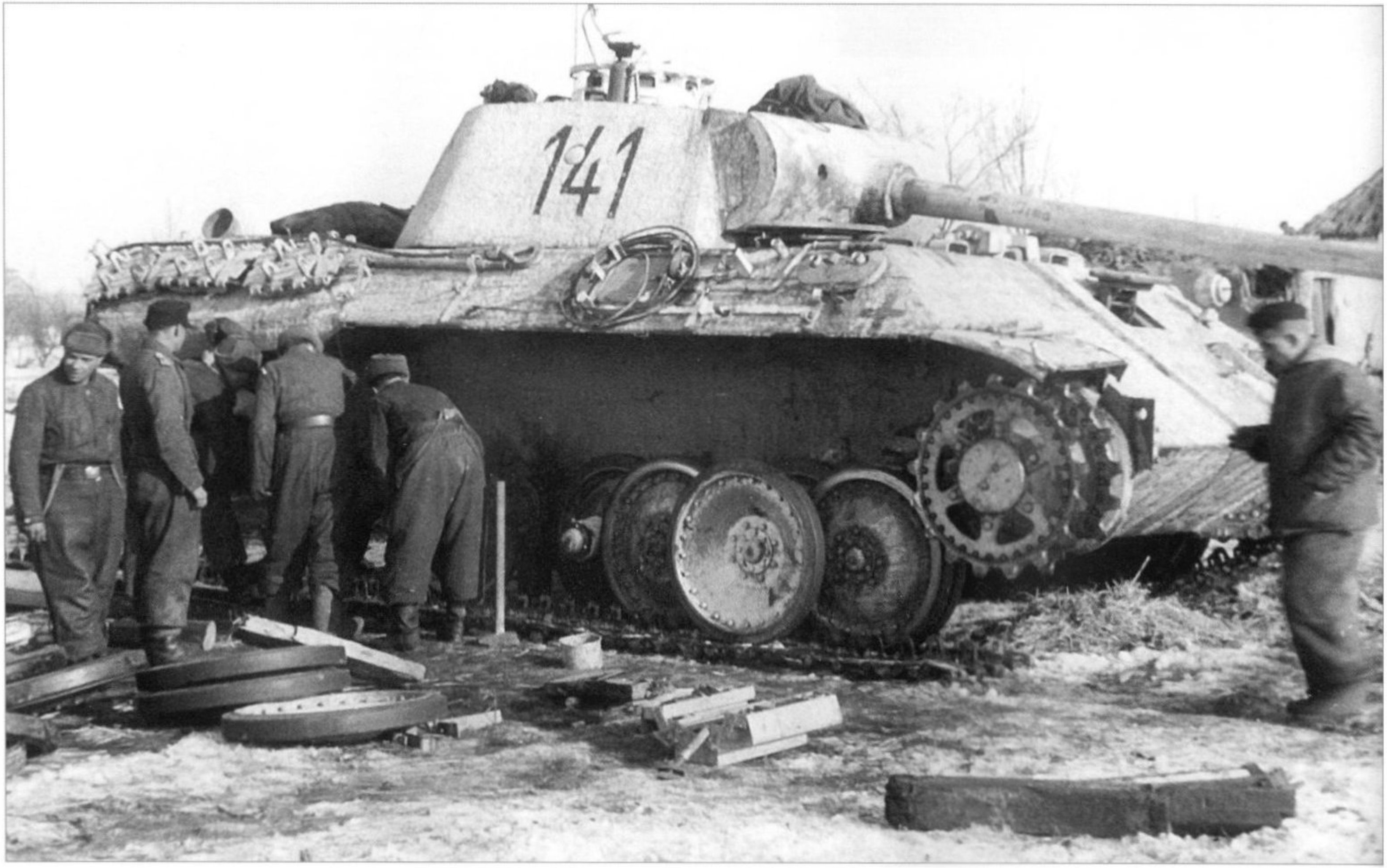
Date	Operational	In need of repair	Total write-offs	Total
10.07.43	38	131	31	200
20.07.43	41	101	58	200
31.07.43	20	108	84	212
11.08.43	9	47	156	212

Oberstleutnant Reinhold, attached to the 4.Panzer-Armee, reported about the Panther on 26 July 1943:

> *The Instandsetzungs-Dienste of both Panther-Abteilungen work very well. About 25 Panthers are repaired per day. There is a shortage of spare parts caused by the high number of losses. Air transport from Germany was a great help, especially engines and fuel pumps. The situation has now improved due to the arrival of repair parts by 'Blitz-Pfeil Transporten' (express trains). It can be expected that most Panzers at the I-Diensten can be repaired short-term.*

On 20 July 1943, the Abteilung V of Pz.AOK.4 wrote a draft about the recovery of Pz.Kpfw.V in the course of the disengagement that had begun on 18 July 1943:

1. *The Pz.Berge.Kp.3, working together with Pz.Berge.Zug 552 at the unloading point Nowo-Borissowka, were alerted on 17 July 1943 by Abteilung 5 after been briefed by O.Qu. It was ordered to drive all available Zgkw.18t into the battle zone in the area of Werchopenje at the break of dawn.*
2. *Further it was ordered to first recover all Pz.Kpfw. from that area to an east-west line that was going through the Southern bend of the Pena River until the morning of Monday.*
3. *On 18 July, 1943 14 Zgkw.18t of the Panzer recovery units mentioned under number 1.) were at work, 2 Zgkw.18t were on the march to Charkow and arrived on the night to 19 July. 19 Zgkw.18t from Panzerregiment 39 itself are added.*
4. *There was no lack of recovery vehicles. Under normal circumstances it would have been possible to reach the command line with these Zugmaschinen. As a result the Gen.Kdo. XXXXVIII.Pz.Korps. had already ordered to not only recover right behind the evacuation line as ordered by Pz.AOK 4, but to recover them back as far as the starting position. The Zugmaschinen and I-Dienste of Panzerregiment 39, which knew the exact location of the damaged Panzers, recovered the Pz.Kpfw. in the most forward line to collection points from where the independent army units recover them further to the rear.*
5. *On 18 July, 1943, at 2 o'clock PM, the leader of Panzer-Bergekompanie 3 reported that the Panzers unable to move could be recovered to the starting positions in time. At the same time he pointed out though that among the broken-down Panzers many had their suspension smashed and lay in unfavorable, softened up terrain under especially strong enemy fire and thus could not be recovered. They had to be made ready to be blown-up instead.*
6. *It must be noted that 52 Pz.Kpfw. were not recovered yet because Panzerregiment 39 was on a constant advance and thus the damaged Panzers got farther and farther behind the frontline. As it is the rule, Panzerwarte and I-Gruppen should have taken care of them. It was already planned that the Werkstattzüge take a leap forward. Because the recovery of such heavy Panzers is very difficult, this was the only correct measure to preserve the Zugmaschinen.*
7. *Due to the rapidly changing situation, everybody had to be used to recover the Panzers stuck on the frontline. This however could not be applied to the most often burnt out total losses.*
8. *A heavy thunderstorm on the afternoon of 18 July 1943 made the trails groundless and greatly hampered the recovery. Already under normal circumstances 3 Zgkw.18t are needed per Pz.Kpfw.V. Due to the lack of spare parts and all the damage caused from driving through minefields, the troops removed suspension parts of heavily damaged Panzers to keep the others operational.*
9. *Furthermore the HKL had to be cleared sooner than planned.*
10. *So it developed that 52 burnt-out Pz.Kpfw. were made ready for demolition. These are mainly total losses. According to*



▲ A Pz.Kpfw.V Ausf.A of 1./Pz.Rgt.2 in Bakschkurino on 25 January 1944. A name similar to 'Irma' or 'Jena' is painted on the barrel. More photos of this unit were featured in RtP1. *AMC*

▲ The five crew members of this Panther under tow can easily be distinguished by their black uniforms with cuff title. Führer-Begleit-Division, March/April 1945. *RT*

the specialists, 7 Panzers at most could have been recycled in large scale maintenance. The regimental commander personally chose the Panzers that were to be blown-up.

11. *Demolition included the gun, turret (which mostly flew off) and the hull, which remained in one piece despite using the strongest charges because of the small damping possibilities.*
12. *7 Pz.Kpfw. could not be blown-up because they were already under heavy artillery and anti-tank fire when the retreat began. The Panzers were not intact but almost all burnt out and heavily damaged.*
13. *Thanks to the relentless effort of all recovery units, the recovery of the other Pz.Kpfw. ran smoothly despite major aggravation by the weather conditions. Because the east-west line described under section 2 did not have to be reached before the late evening hours of July 19 1943, no problems appeared.*
14. *On 18 July, 1943 6 more Zgkw.18t were assigned by the Heeresgruppe. They did not arrive until 23 July 1943 though.*
15. *48 hours are given for recovery from the first line up to behind the former starting position. Time starts in the evening of 21 July, 1943. The area can be totally cleared of damaged Panzers in the available time. Already on 19 July, no damaged Panzers remained in the past working spaces of the Werkstattzüge and I-Gruppen in the area of the 2. evacuation section.*

    Tracks and road wheels that Abt. V brought forward as a precaution arrived in the Panzer-Ersatzteillager B in Denjepropetrowsk on the evening of 18 July. The tracks arrived in the night of 20 July in Nowo-Borissowka. They were only meant to make Panzers operational again but were not needed anymore for the damaged Panzers because the majority were already safe.
16. *This clearly shows that the demolition of 56 Pz.Kpfw. and the loss of 7 Pz.Kpfw. that fell into enemy hands without prior demolition, were only a result of the surprisingly fast*

withdrawal of the HKL, the unfavorable weather conditions and the enemy.

These losses could not have been avoided by any other way of deploying the recovery assets.

17. *According to this, the strength of Panzerregiment 39 is as follows:*

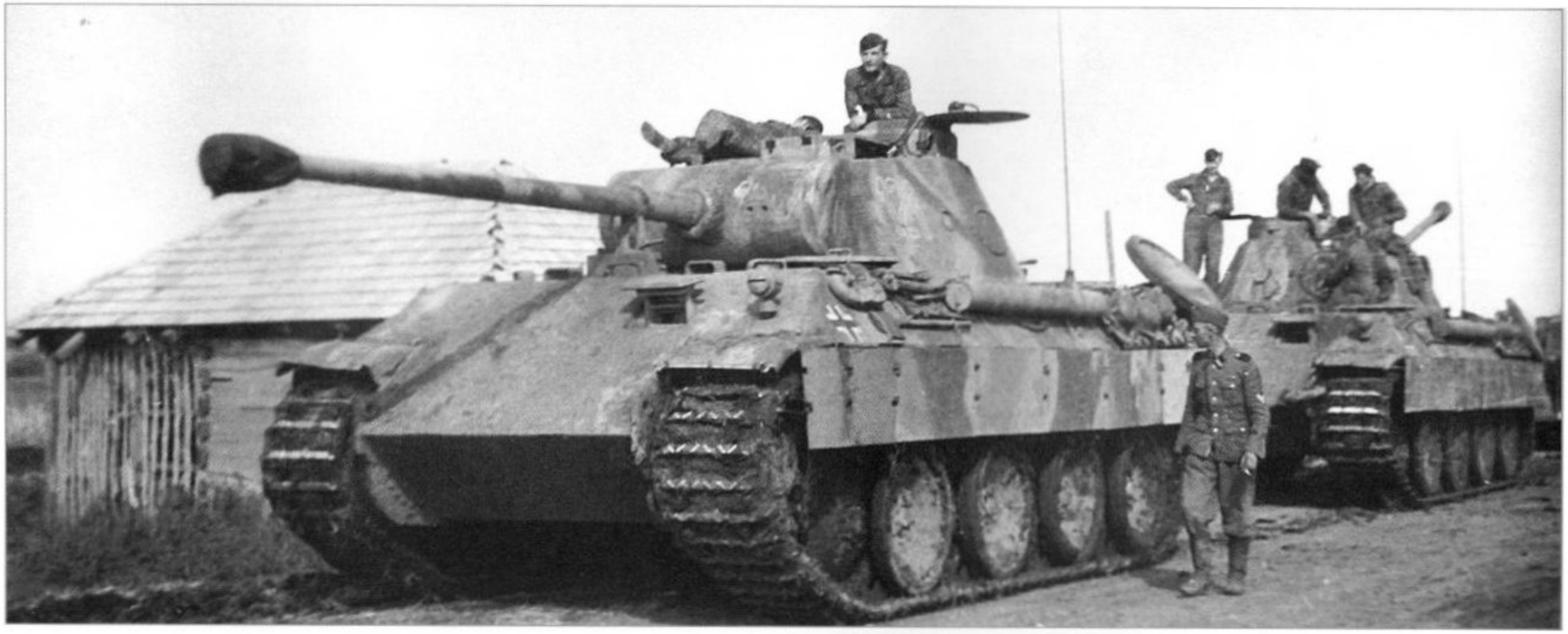
41 Pz.Kpfw.	*Operational*
85 Pz.Kpfw.	*In maintenance by the regiment's own I-Dienste, that means by Pz.Abt.52 because the I-Dienste of Pz.Abt.51 need to be loaded fast.*
16 Pz.Kpfw.	*With greater damage, sent to H.Pz.Za. Magdeburg-Königsborn.*
56 Pz.Kpfw.	*Burnt out. Seven of them fell into enemy hands on 19 July 1943 without being blown-up.*
2 Pz.Kpfw.	*Already burnt out before the attack due to engine fire.*
200 Pz.Kpfw.	

In an appendix to their inventory report, Pz.Abt.51 gave the reasons for their total losses as of 10 August 1943 as:

5 Pz.Kpfw.V
Position: *1.5km north of Alisowa*
Damage: *Total breakdown due to tank and anti-tank fire*

Another such appendix could be found as of 20 August 1943:

4 Pz.Kpfw.V
Position: *2km South east of Achtyrka*
Damage: *Totally burnt-out due to enemy fire*
3 Pz.Kpfw.V
Position: *East of Trostjanez*
Damage: *Totally burnt-out due to enemy fire*



▶ A dirty Panther Ausf.D from an SS unit is towing one of its kind. Notice that '121' has a new track with chevrons on the left and an old, smooth track on the right. *AMC*

2 Pz.Kpfw.V
Position: *Eastern border of Achtyrka*
Damage: *Pak hit into engine, burnt out. Transmission failure*

2 Pz.Kpfw.V
Position: *Kudryiewy, at the Rollbahn Achtyrka - Begoduchoff*
Damage: *Total breakdown after enemy fire, Pz. blown-up*

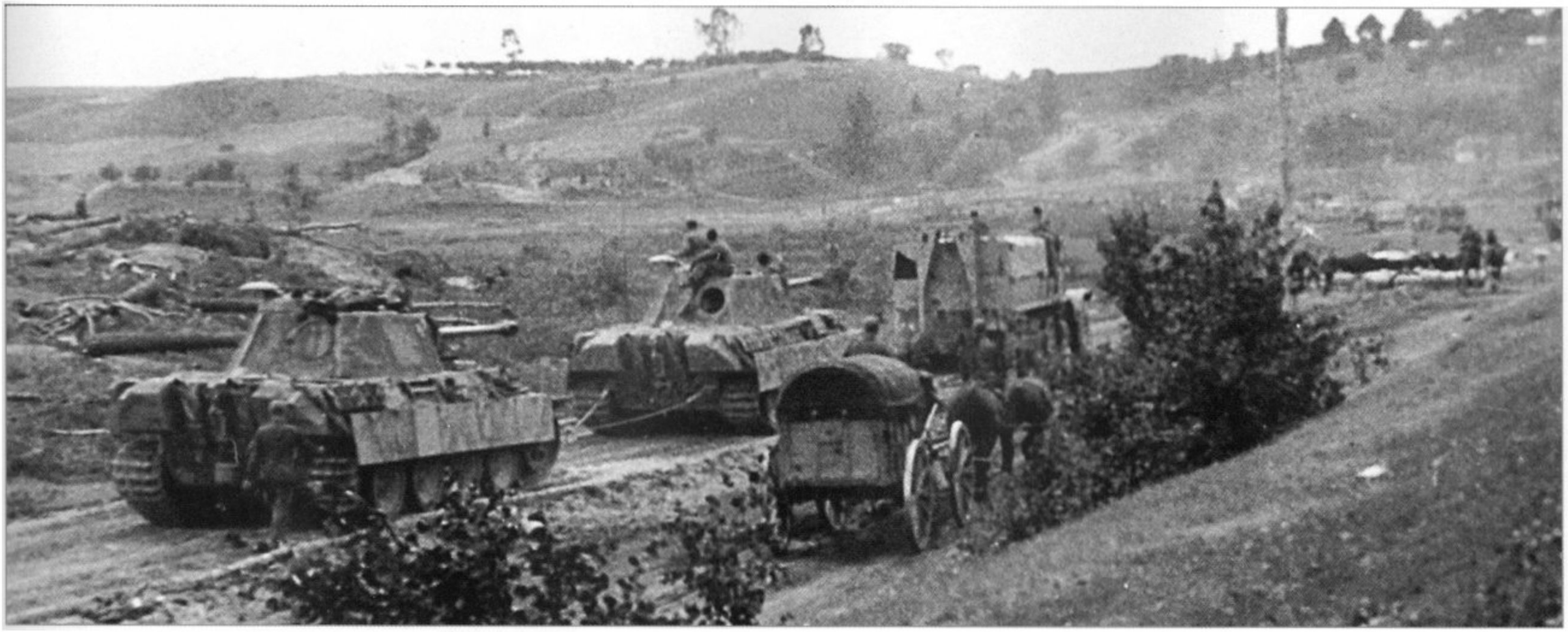
Definitely Grown-Up

The following two documents state that the Panther reached the same level of technical reliability as the other standard Panzers, the Pz.Kpfw.III and IV. The 13.Pz.Div. [sic] expressed their opinion in a comment on a report of the I./Pz.Rgt.2 as of 20 October 1943.

> *The technical failures that occur on the Panther appear on the Panzerkampfwagen III and IV the same way. Only the fact that the Panzer V easily catches fire makes modifications necessary.*

Six months later, on 6 May 1944, the leading Kraftfahroffizier from the Gen.Insp.d.Pz.Tr. commented on the report of I./Pz.Rgt.2 from 22 April 1944:

> *The report confirms that the lifespan of a Pz.Kpfw. Panther was extended due to further improvements of the components.*



◀ Tow cables always had to be crossed and connected by a shackle in the middle. Note the spade on the Zgkw. A very rare sight! *AMC*

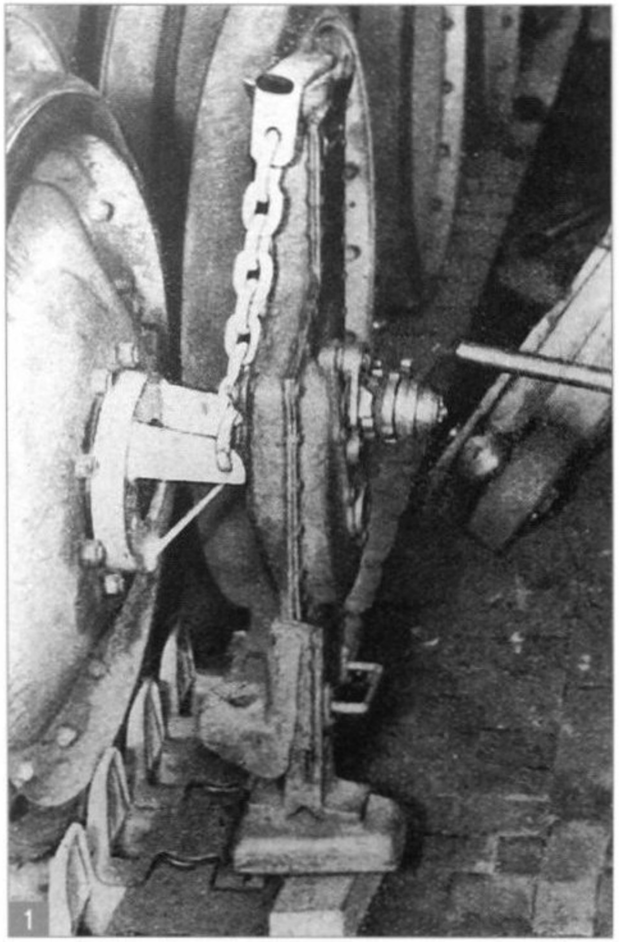
The average lifespan of a Panther is now close to the one of a Pz. Kpfw.IV with approximately 1500 - 2000km between two major maintenance services.

In an undated report (ca. Dec43), the 11.Pz.Div. stated "that the Panther engine could generally run 1500km, sometimes 300km " [sic]. In the same document, the 24.Pz.Div. was quoted that their "Panthers from I./31 had covered a distance of 5-600km, thereby suffering seven engine defects ('Motorenschäden')", without specifying the nature of the defects. Fuel consumption was recorded as 5-600l on the road and 7-800l cross-country. Additionally, the 24.Pz.Div. said it preferred four companies of 17 Panthers instead of three companies of 22 Panthers.

On 18 January 1944, the Panzeroffizier at the Chef Gen.St.d.H. reported on his visit to the 16.Pz.Div.:

Since the relocation of H.Gr. South, the Pz.Rgt.2 suffered mostly from breakdowns from moving. No time for Panzer maintenance. Losses due to enemy small. ...

[Regarding the] Panthers from the newly arrived Panther-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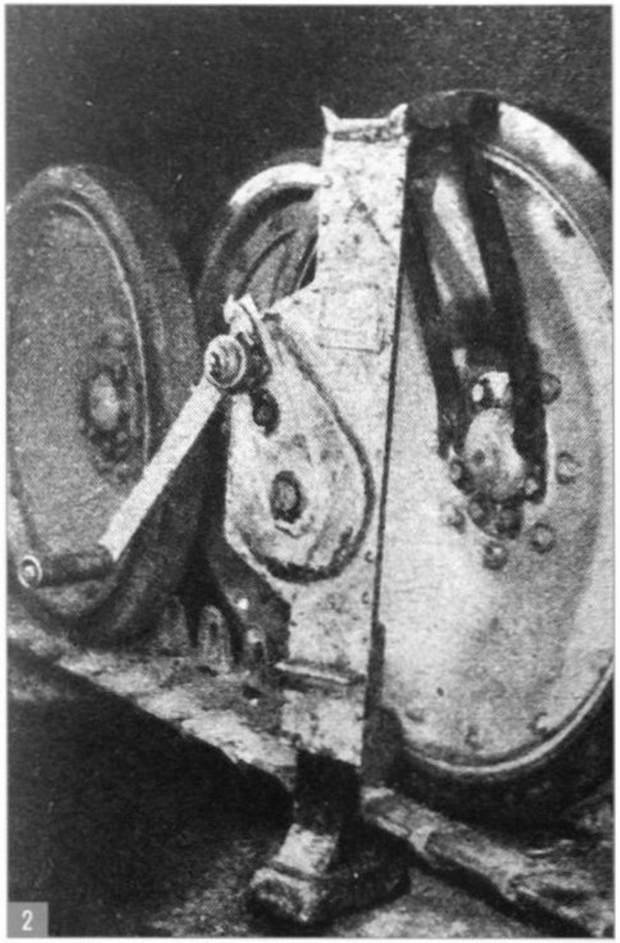
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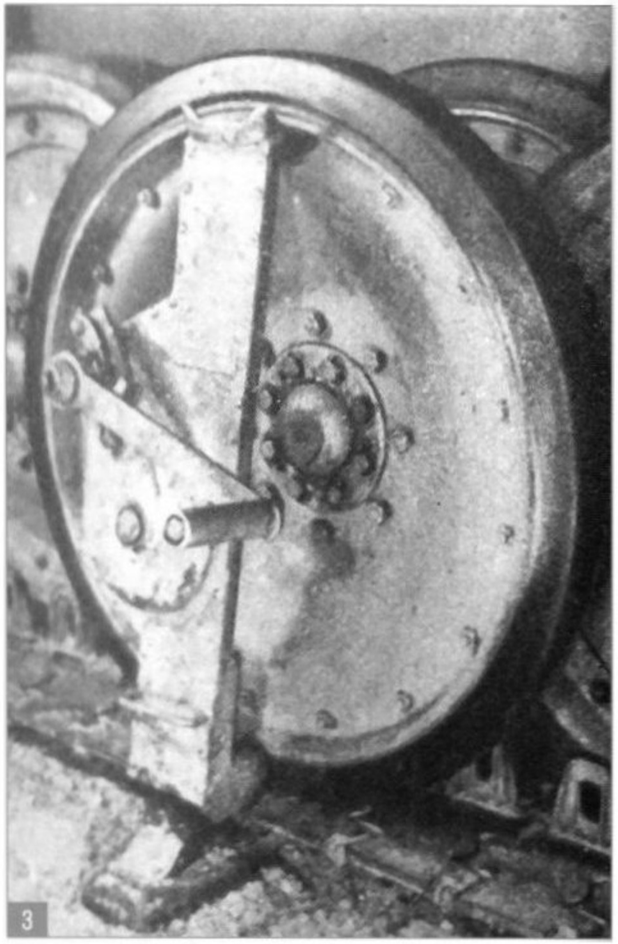
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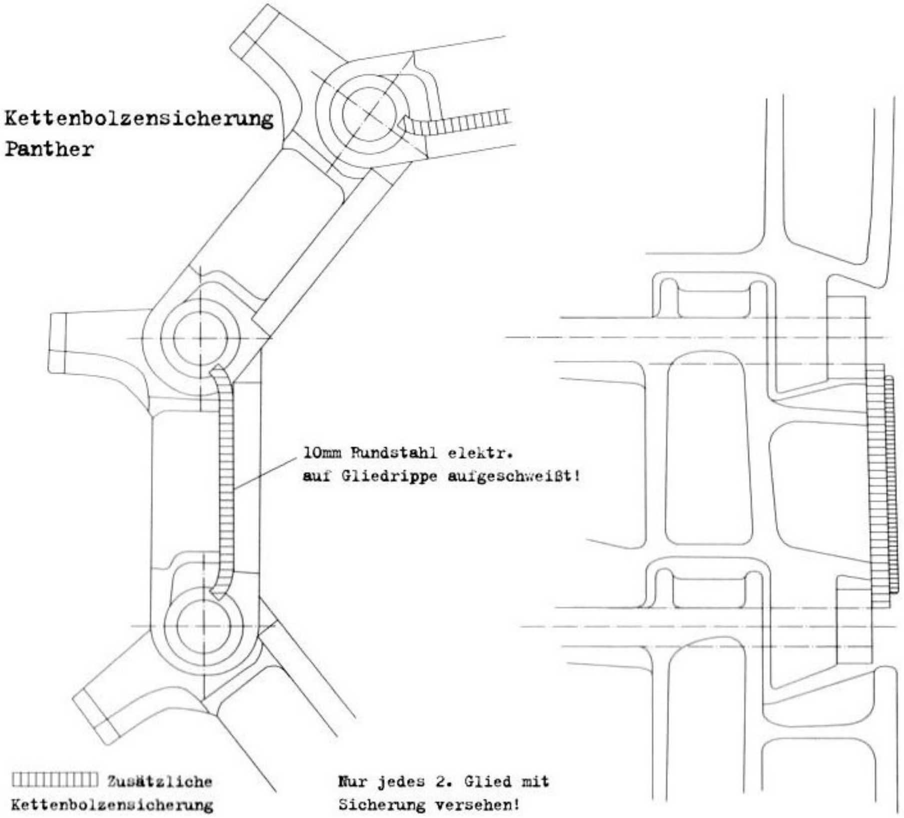
1. A hoist to lift the road wheel and torsion bar.
2. Removing an outer road wheel with the 'Aussenlaufradheber'.
3. Removing an outer road wheel without the 'Aussenlaufradheber'. *D655/30a*

> *Abteilung, each Panther has driven 500km. Because the engines normally break down after 1000km, these relocation movements are serious decisions. A 200km road-march means a fifth of the life span of an engine. Frozen roads, especially cobbles [or paving stone 'Pflaster'], strain the suspension, especially the tracks, severely. ...*
>
> *Panther is very good in action [sic], but needs a lot of lubricants and spare parts. Weapon's performance very good. The final drive is now good. Road wheels on the left side wear out rapidly. The Panther easily catches fire when on a steep incline. Probably it is gasoline leaking from a valve. ..."*

Oberstleutnant Mildebrath, Insp.d.Pz.Tr. reported on 9 September 1943 from his visit to H.Gr.South:

> *[I./Pz.Abt.23] mentioned the exceptional performance of the gun and the outstanding armor as especially pleasant. Fires after full penetrations have not occurred anymore. Generally, enemy fire is only responsible for 10% of all losses.*

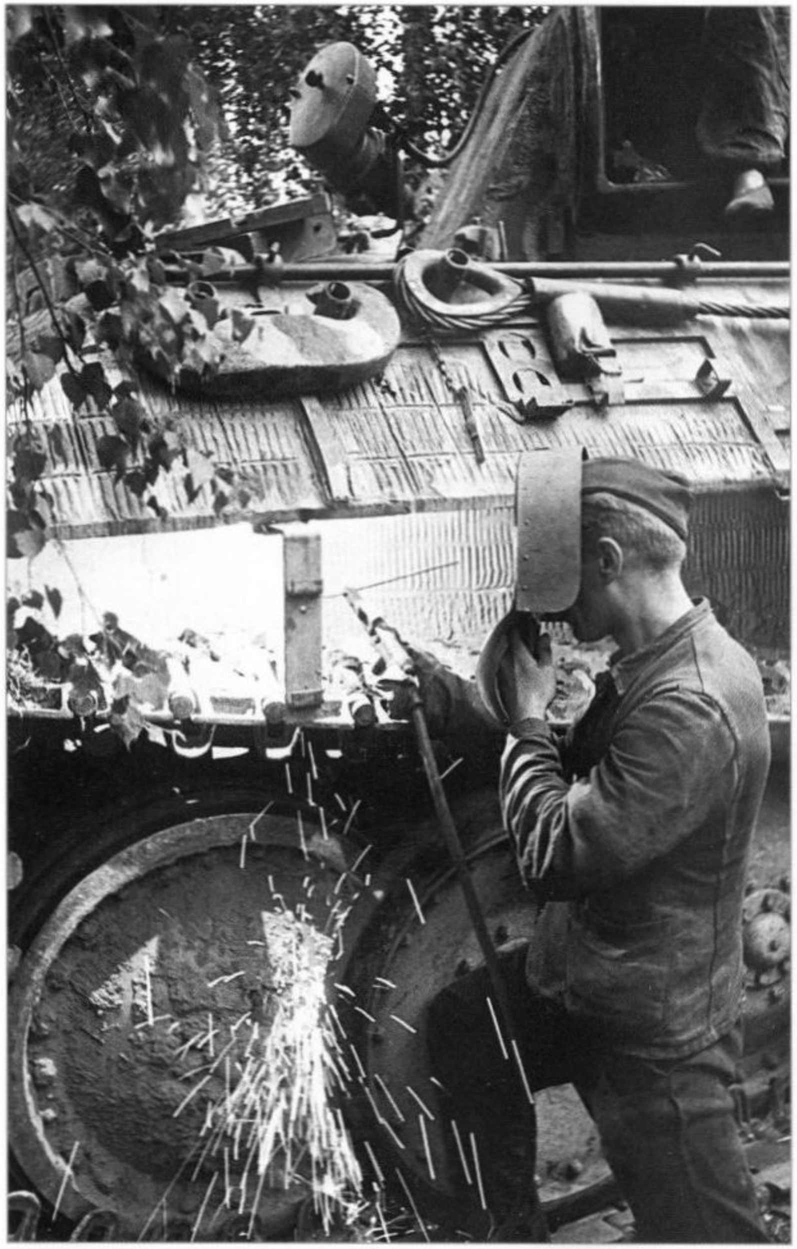
◀ It was probably easier to lift single roadwheels than whole Panzers. *YZ*

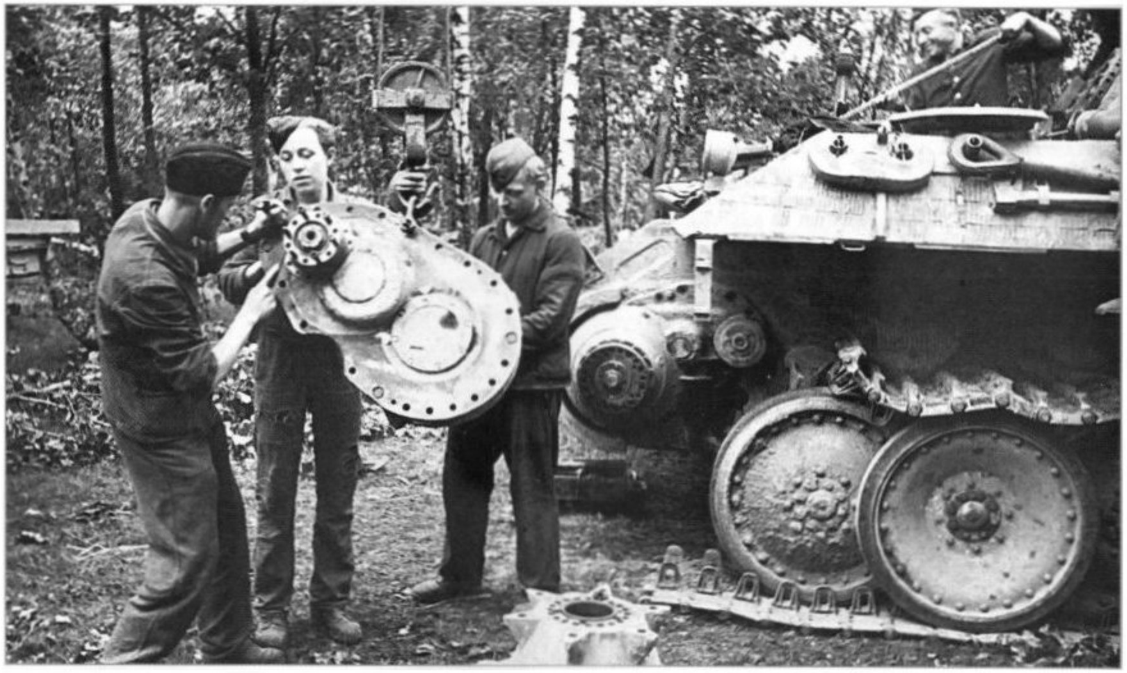


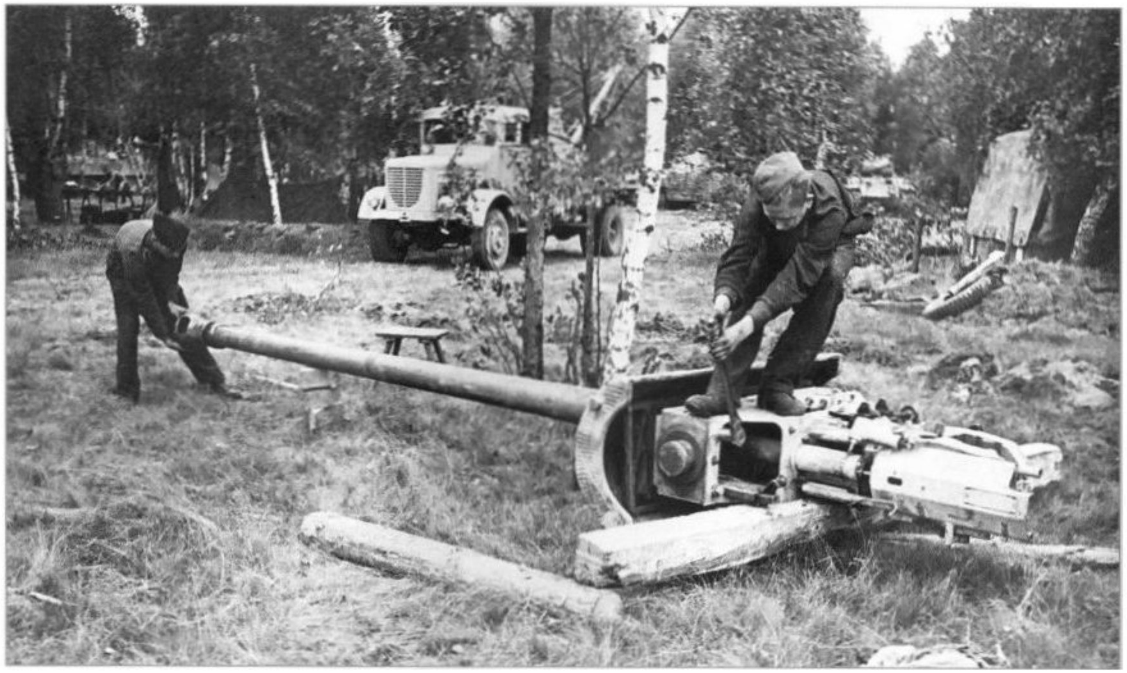
▲ In the 'Nachrichtenblatt der Panzertruppen' from August 1944, the Generalinspekteur recommended an expedient track pin locking system for Panther-Abteilungen. He stated that the track pins of the Panther often break closely to the pin head. During a 40km road march of an unspecified Abteilung, up to twenty pins of each Panzer broke. Because of the track movement, the broken off parts are pushed outside and require a longer technical halt necessary for driving in new pins.

The outer part of the pin, with its locking ring and cotter pin ('Hettmannstift'), tears off the side skirts ('Schürzen') along with their holders when it pops out. This then again requires longer welding and bending. The Abteilung then added an additional track pin locking system that is apparent from the drawing shown here.

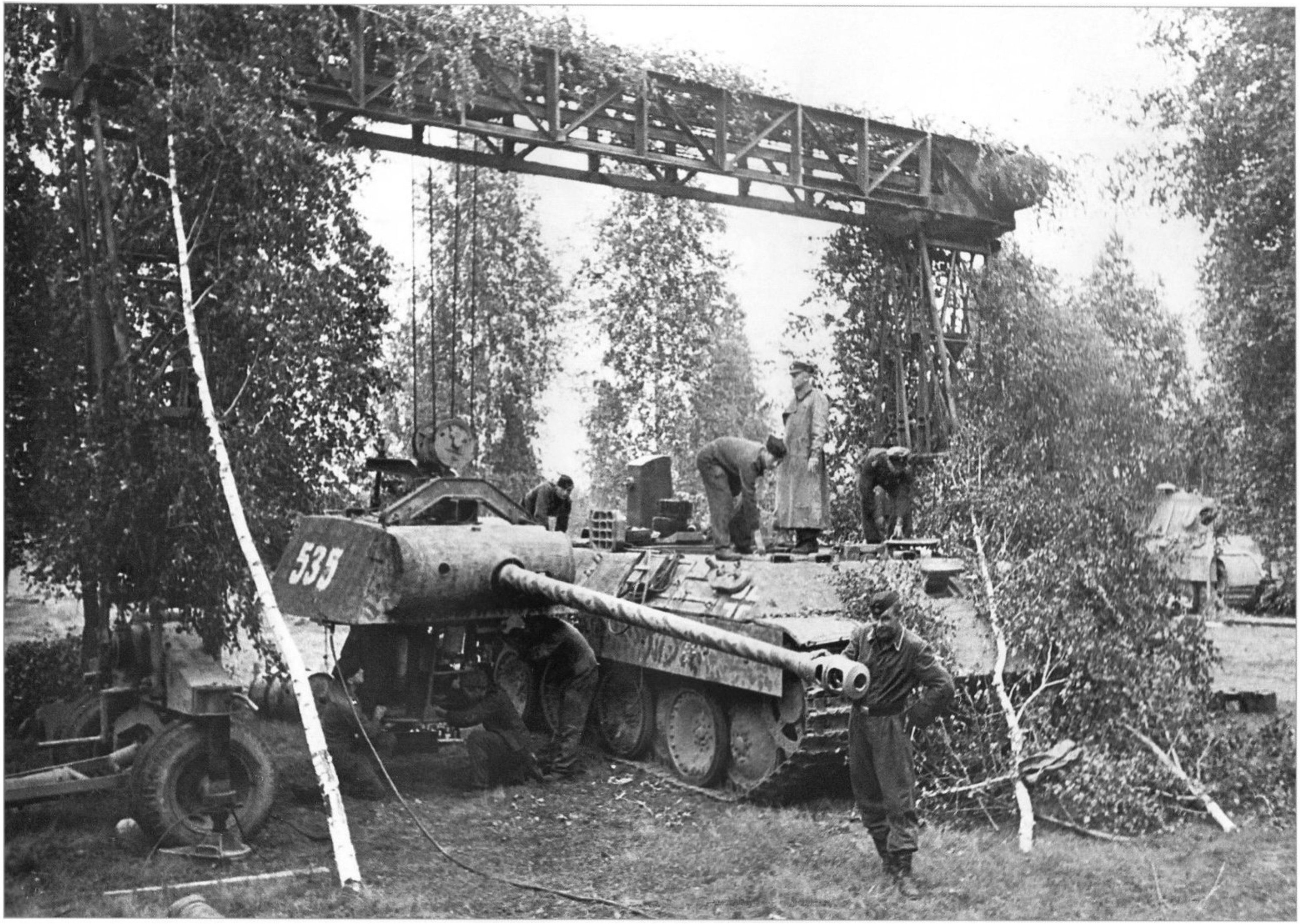
To modify both tracks on each Panther, one steel bar, 11.18m long and 10mm in diameter, was necessary. The welding only had to be done on every second track link and took about three hours per Panzer. The Panthers of this particular Abteilung have since run an average of 300km and this locking mechanism has prevented the popping out of any track pins; thus enabling the Abteilung to drive until the next longer halt. *Re-drawn by Daniel Jurt*







Panthers of 5.SS-Pz.Div. Wiking undergo all manner of repairs in May 1944, both large and small. Even with cranes and hoists, the work is labor intensive and constant. *4x National Museum of Contemporary History of Slovenia*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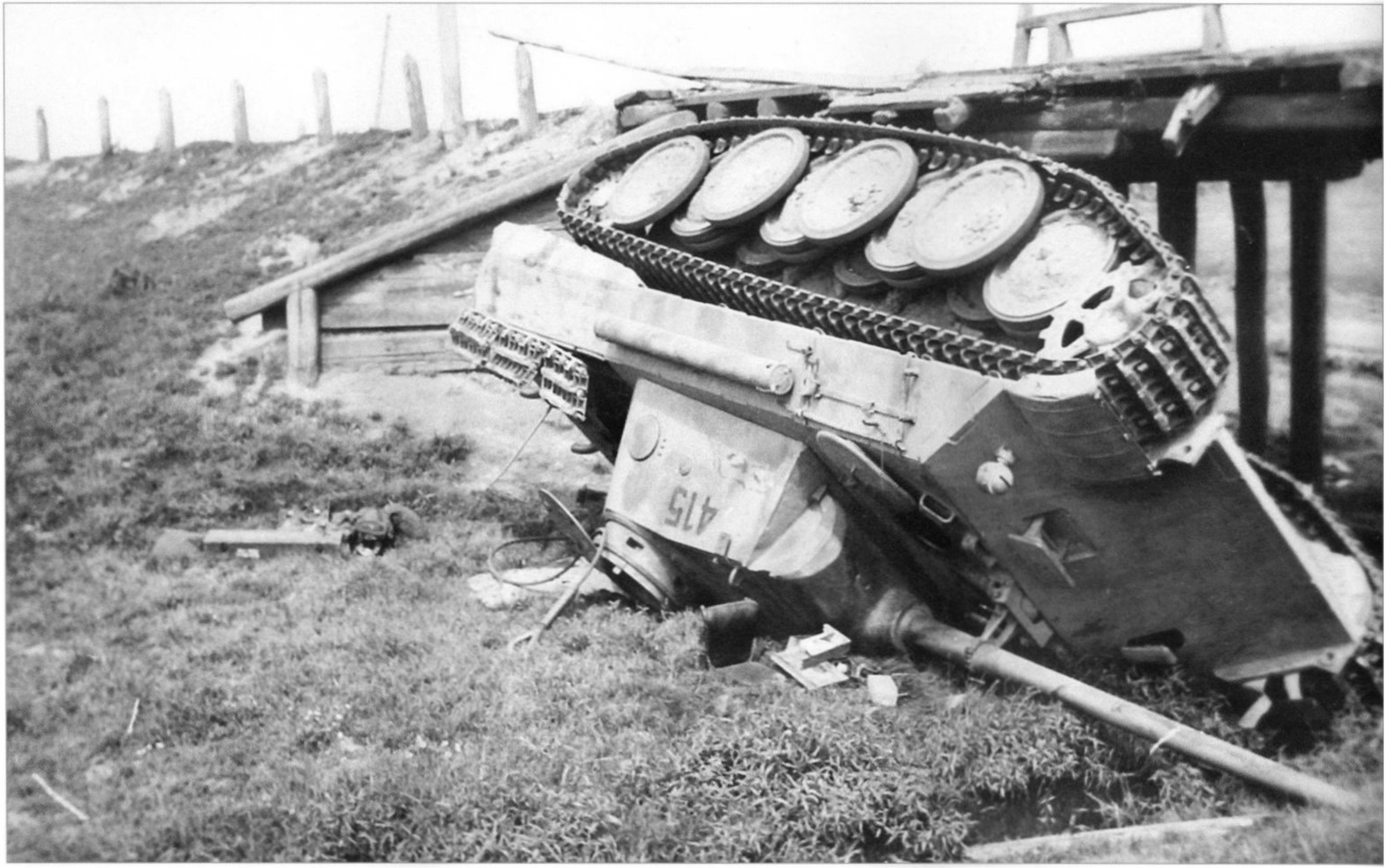

▲ Panther '415' from Pz.Abt.51 with the black Panther marking on the turret side, fell from a bridge. While the outside is in mint condition, items on the inside might have been damaged, such as the already sensitive radio equipment. *AMC*

4

Factors Affecting Readiness

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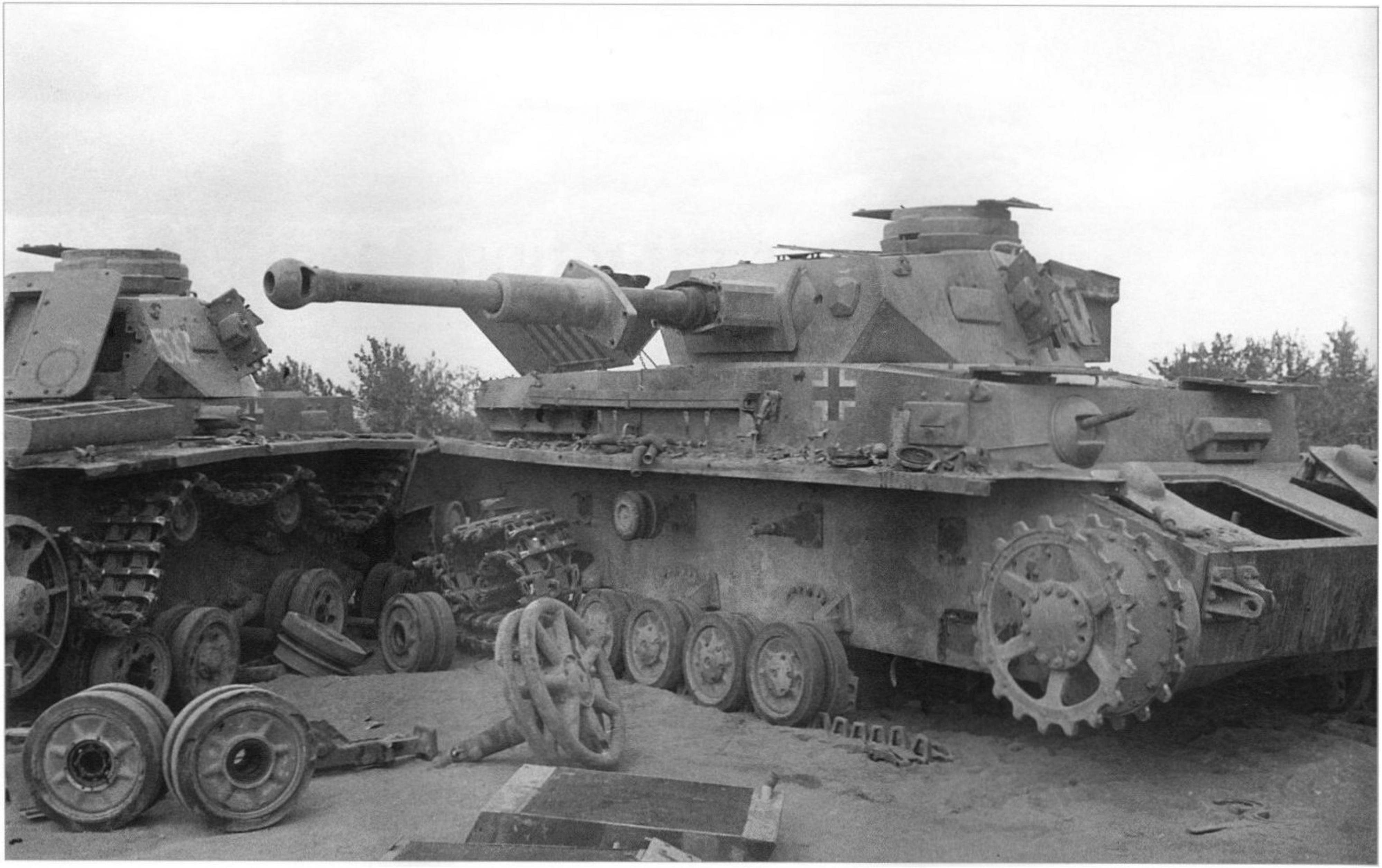


▲ According to the Heereswaffenamt in January 1942, the spare part requirements of a Pz.Kpfw.IV were 2 - 3 times as high as those for a Pz.Kpfw.III. *JH*

Introduction to Some Factors

Sonderführer Häring, a Panzer specialist of the Maybach-Motoren Werke, who by December 1943 had already been visiting the divisions of H.Gr. South for a year, listed the reasons for the currently bad Panzer situation in the sector of the H.Gr. South in a report that was forwarded by the Gen.Qu. on 11 December 1943. The fact that it comes from H.Gr. South does not detract from its relevance to other Panzer units.

Insufficient Training of new (young) Panzer crews (drivers) and Panzerwarte, especially in newly formed units

The brief training of Panzer drivers, especially in newly formed units, is reflected in the recent large increase in damaged components. Because most of the young Panzer drivers have no technical background, it is totally impossible for them to adopt all necessary skills that are needed to keep the vehicles operational at all times with such short training. Often the training is limited to the driving school necessary to acquire the Panzer driving license so that, at the front, the drivers possibly realize a failing part of the vehicle but have no clue of how to help themselves (irregular running engine, or improper running of the radiators, etc.). This forces the driver to keep on driving the vehicle until it breaks down due to more serious damage (total damage of a component). To increase the operational readiness of the vehicles, the training of the drivers by the Panzer training schools ('Panzertruppenschule') and 'Aufstellungsstäbe' in Germany has to be more solid and done with more care because eventually the driver is the technical care taker of the vehicle during the operation.

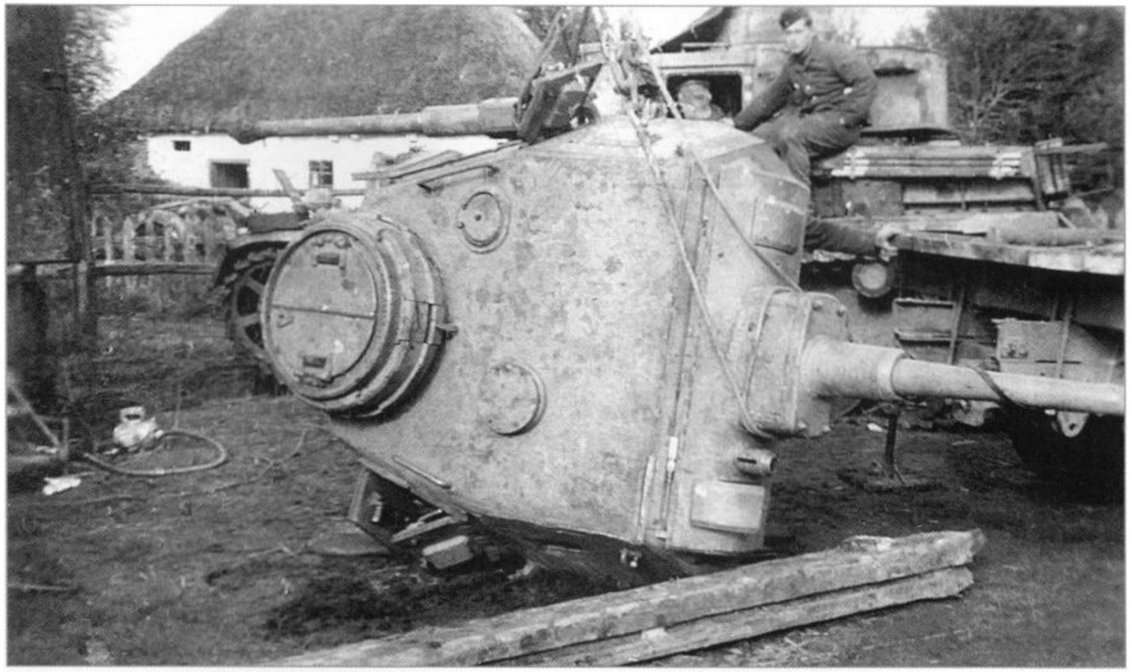
Insufficient maintenance and care of the vehicles' components by the troops

The terms 'maintenance' and 'care' have nowadays become foreign in such units. This can be soundly proven by taking a look at their components, especially the engines. In these cases the units should be advised of the appropriate measures by the high commands in the sharpest tone and the troop engineers shall be held totally responsible. Furthermore, these units should be frequently visited by specialists supporting the troop's maintenance work on one hand and on the other also make sure that the valid regulations are applied. It can be noticed these days that even the troop engineers often do not know about proper maintenance and execution of measures, such as for winter operations, and that they are not informed about how to obtain the necessary [winter] devices. Such a poor supervision of the troops influences the maintenance of damaged vehicles considerably. For the selection of troop engineers, especially for heavy Panzer units, an exceptionally high standard must be applied. The troop engineers for Panzer units have to be outstandingly hearty practitioners.

Lack of spare parts and complete components (engines, transmissions, final drives, etc.)

The maintenance situation is especially influenced by the lack of complete components (engines, transmissions, final drives,

▼ A Pz.III turret is lifted with a Kfz.100, but not enough attention was paid to how to attach the cables. *HE*

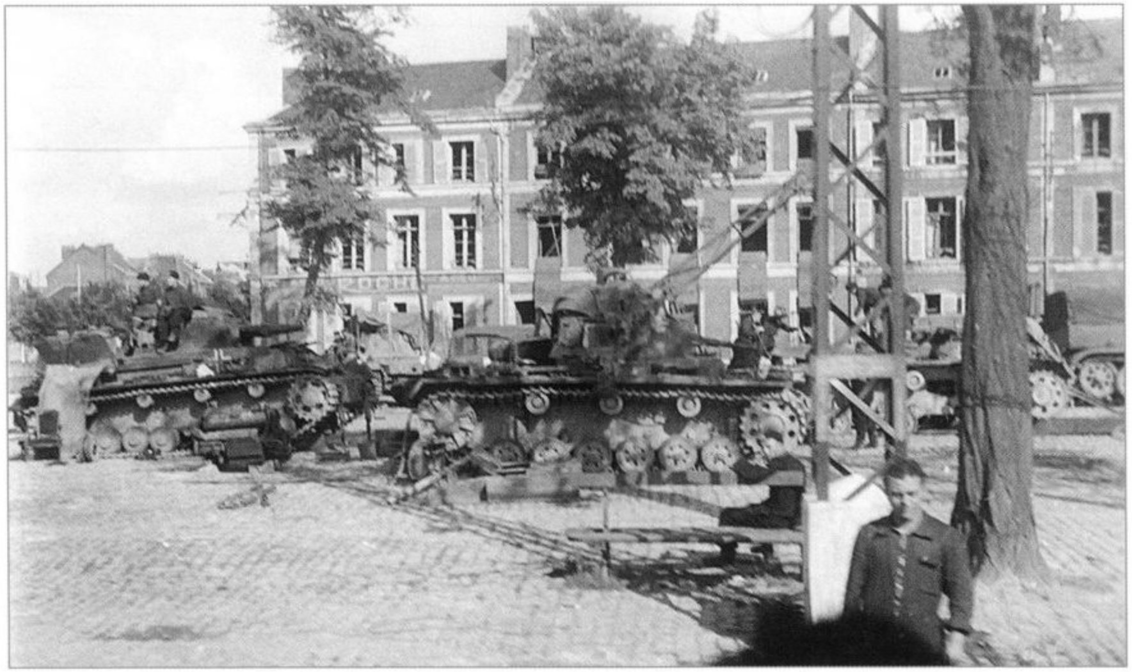


etc.). Because the troops try very hard to get their vehicles back to the front line but lack complete components, they aspire to maintain the components themselves. Only few units have the possibility to perform such type of maintenance. Most others do not have the necessary means at hand. There was a case where a unit strived to maintain engines and they had a large part of the necessary spare parts but lacked even a key to exchange the spark plugs. Or the maintenance of engines is carried out so faultily that their reliability is questionable right from the beginning.

Lack of large-scale maintenance of Panzers, especially of components (engines, transmissions, final drives, etc.)

One of the main problems with the delivery of repaired components is that the I-Dienste are too fragmented. Since the majority of the Panzer units are in the Southern sector and a military decision can only be brought by the Panzerwaffe, everything needs to be done to extend the component maintenance at Panzer-Instandsetzungsgruppe South. It is not enough to just keep advising Panzer-Instandsetzungsgruppe South to increase their output of repaired components, but to take the necessary actions for such a large-scale maintenance at the K-Werk. It is not the whole purpose of the I-Dienste to maintain the components themselves, but to only carry out the quick repairs while the components with heavier damage are evacuated to the K-Werk. That is to say that the troops only mount or dismount complete components. Thereby the time required for maintenance is decreased considerably and more vehicles are available for combat.

▼ Pz.Kpfw.III and IVs are being repaired with the help of a building crane somewhere in France. *LA*



At the same time the requests of the troops for spare parts for general overhauls will cease and these spare parts will then be exclusively available to the K-Werk for the large-scale maintenance. It is not the K-Werk's fault that their output is unsatisfactory. The only reason is that they have never been properly equipped and supported for such large-scale maintenance. Since everything one can think of has been done for the Kfz-Instandsetzung, the same should apply even more for the Panzer-Instandsetzung and their components.

The comparisons of Panzers repaired within the field troops and the Panzers repaired at the K-Werk give an entirely incomplete picture. The vehicles sent to the K-Werk need a general overhaul while the vehicles reported by the troops often just needed quick repairs like exchange of a final drive, exchange of a track or some road wheels, etc. that can be carried out within a few hours or within a day.

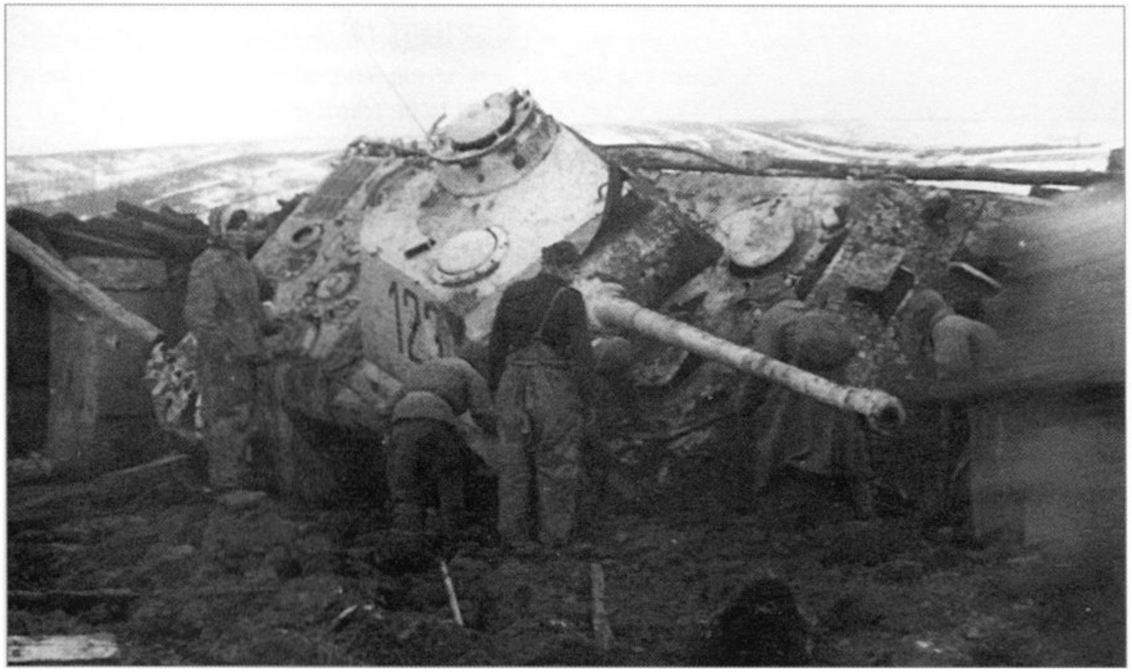
Another very elaborate report that substantiates the main reasons why a high number of Panzers had been constantly non serviceable was given by the 2.SS-Panzer-Grenadier-Division 'Das Reich', dated 14 April 1943. By that time the division was grouped into two Abteilungen with three companies each consisting of mostly Pz.Kpfw.III and IV and an 8th company equipped with ten Tigers. It was in combat on the Eastern Front since February 1943.

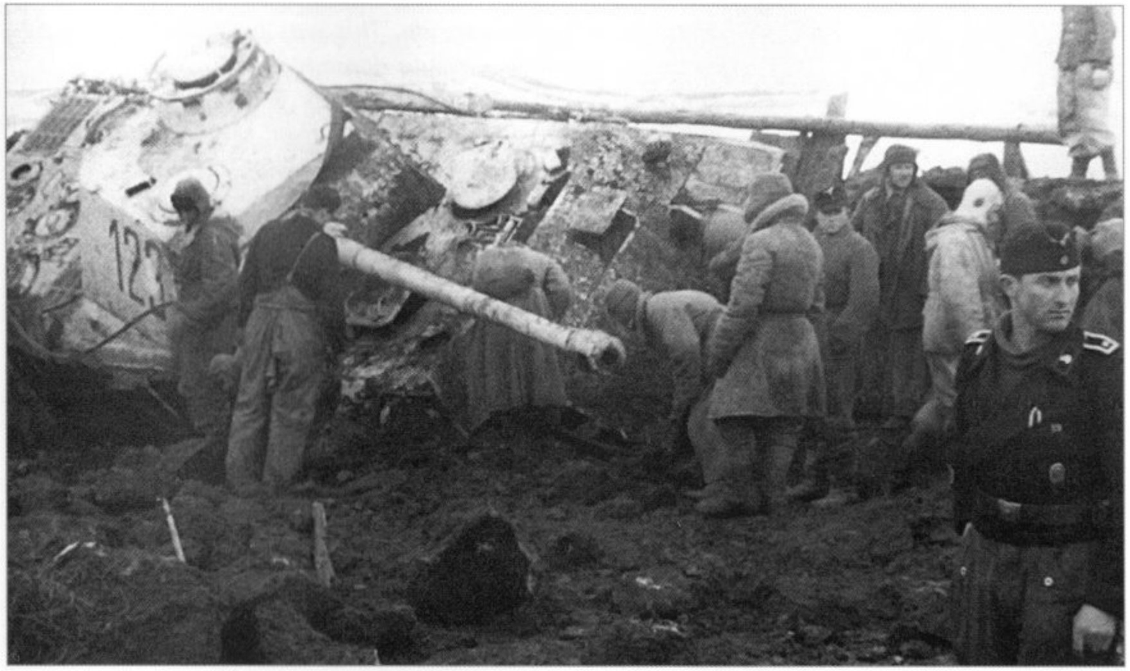
The reasons for the constantly high number of non-operational

Panzerkampfwagen of the SS-Pz.Rgt.2 are basically the following:

A. Poorly or insufficiently trained drivers and specialists.

1. *The I./SS-Pz.Rgt.2 was formed in Fallingbostel and then transferred to France. Due to the lack of transport, it drove approximately 300km with its Panzers before it went into action. The II./SS-Pz.Rgt.2 received its Panzers only 14 days before it was transferred to the East. Combined with the little fuel at hand, only an exceptional short time of 8 – 10 days was available for driver training.*
2. *The drivers were not acquainted with winter conditions. There was no snow or ice in France nor was there similar terrain that could have been used. As a result, the drivers were absolutely no match for the especially difficult terrain in the area around Kharkov. The Panzers got stuck in the snow which led to an exceptional high number of damaged clutches and driving gear.*
   The missions often were conducted during the night. This was completely unfamiliar to the drivers.
3. *The specialist for the I-Dienste for the newly formed II.Abteilung had to be taken from the division itself. It is natural that the parent unit ('Stammtruppenteil') did not give away the best material. The 'Panzerwarte', engine- and transmission mechanics were retrained in short duration courses. This was even more difficult because many of the men were not fully educated professionals but were semi-skilled from other professions.*
4. *In addition, the SS-Pz.Rgt.2 is missing 60 specialists.*
5. *The truly trained specialist had to remain with the Wkst.Kp. to perform the large repair work so that the I-Gruppen did not have 100% of specialists available.*
6. *The few specialists have to spend a considerable part of their available time to supervise and train the semiskilled workers.*
7. *Furthermore, the untrained drivers often detected minor*





▶ During a night move in Jan44 this Panther of 1./Pz.Rgt.2 fell through a bridge in the area of Shadany. First, engineers had to blow up the frozen earth. When this was done six Panthers pulled turret number '123' out of its uncomfortable position. *AMC* *damage which could still be repaired with the on-board tools too late or not at all. This then led to more severe damage which needed to be treated in the Wkst.Kp.*

B. These difficulties in the maintenance situation were intensified:

1. *The companies could carry only a few spare parts as there is restricted loading space on the le.Zgkw.1t (Sd.Kfz.10).*
2. *The loading and carrying capacity for spare parts of the Wkst.Kp. is too small.*
3. *Some parts, such as turrets and sometimes engines, are not available or are available only in small numbers at the supply depots.*
4. *The I-Gruppen of the tank companies are not equipped with the necessary special tools. Missing are, for example, tools to dismount road wheels and shock absorbers, so that these tasks cannot be performed by the I-Gruppe and the tanks have to be sent to the Wkst.Kp.*
5. *Low-bed trailers could not be used on the narrow lanes and the deep snow. Therefore Pz.Kpfw. had to be recovered on their road wheels, which then resulted in even greater damage to the suspension. This was particularly the case when the steering gear was damaged.*
6. *The current outfit of the Wkst.Kp. with crane vehicles is inadequate. Maintenance work that requires lifting the turret or the rear deck is most common. According to the K.A.N., only 1 Kran-Wagen 3t (Kfz.100) is permitted. But the Wkst.Kp. implicitly needs a second crane vehicle. Especially for a leap-frog deployment of the Werkstattzüge.*
   The permitted Dreh-Kran-Kw. 6t (Sd.Kfz.9/1) was not delivered to the regiment. It is undoubtedly required though since the Kfz.100 does not have the lifting capacity to remove a turret.

To correct these short-comings we propose:

1. *Immediate allocation of trained specialists, preferably armament workers from homeland factories, workers that have been u.k. (unabkömmlich = in a reserved occupation) so far.*
2. *Equip the I-Gruppen with special tools.*
3. *Adapt the K.A.N., so the I-Gruppen are permitted additional Lkw to carry along more spare parts.*
4. *Substitute the number of m.Lkw of the Panzer-Wkst.Kp. with s.Lkw.*
5. *Assign the needed crane vehicles (Kfz.100).*
6. *Because from experience the Panzer-Wkst.Kp. is considerably remote, the Pz.Kpfw. currently need to be recovered over long distances. To avoid this, it is proposed to equip each Panzerabteilung with an additional I-Staffel which is able to repair these damages on the spot. Thereby the Wkst.Kp. is relieved from minor repair work and the Panzers can return to the fighting troops much faster.*

   Proposal for the equipment of the I-Staffel:

   Motor vehicles
   1 Kran-Wagen 3t (Kfz.100)
   1 s.Lkw (A) with workshop equipment
   2 s.Lkw (A) for spare parts
   2 le. gl. Pkw

   Personnel
   1 Werkmeister (K)
   1 Leadman
   8 Panzerwarte
   1 Panzerfunkwart
   1 Panzer electrician
   1 Waffenmeistergehilfe

   This was implemented as an experiment with the SS-Pz. Rgt.2. It proved to be of great value, though the personnel and the vehicles had to be taken from the Panzer-Wkst. Kp., which severely reduced its performance. Outfitting the I-Staffel with special tools is essential.

7. *The equipment of the Panzer-Berge-Zug with six s.Zgkw.18t (Sd.Kfz.9) in insufficient.*
   With the road and weather conditions that were dominating

during the last battles, which were snow drifts and muddy roads, the Panzer had to be in most cases recovered by two Zgkw. This heavy duty resulted in much clutch and steering gear damage on the Zgkw. This again delayed the recovery considerably. During the retreat, several Panzers had to be blown-up because the Zgkw. could not cope with the work load. Further losses occurred when more Zgkw. ran onto mines or came under fire. The situation only became somewhat bearable when the Berge-Zug of the s.Panzer-Kompanie could be pulled up to recover the remaining Pz. Kpfw.III and IV.

Pz.Kpfw.VIs can only be recovered with three Zgkw.18t under very favorable conditions and this can only be considered absolutely makeshift. The development of more powerful recovery vehicles is essential.

Contrary to the prohibition to recover Pz.Kpfw.VI with Tigers, the recovery of a heavily bogged down Tiger or a recovery in difficult terrain is only possible with the help of several Tigers used as recovery vehicles.

◀ Open tracks could be used to recover a stuck Panzer. This trick might be used with these two stuck Tigers. *AMC*

Spare Parts: Buy them Yourself

When indicated, some parts of this overview have been based on an extensive article of Oberstleutnant Franz Luckner from 1972. However, many things he stated could be cross-checked. You will find most of the things mentioned hereafter in the original war diaries and experience reports also presented in this book.

The manual 'Die Heeresversorgung im Kriege' (army supply in wartime) simply stated: "Spare parts for Kraftfahrzeuge must be requested at the Kraftfahrpark." Which spare parts the troops could order, how they could order them, and who could order them from the Kraftfahrpark was not mentioned. Whether stock was available, where it came from, and how it was transported was also not mentioned. This order was still based on the army of the First World War where no large units had to be supplied yet and the many different types of vehicles precluded a centralized supply. The troop supplied itself directly at the manufacturer or dealer. An ordnance supply depot or equipment/ordnance park was not put in place. The superior 'Gruppen-' namely the Wehrkreiskommando, only assigned the budgetary funds and controlled the books. This system was retained until the beginning of the Second World War. This description by Luckner was confirmed by contemporary examples and by the veterans Oberschirrmeister Paul-Friedrich Koch (Pz.Rgt.5) and Franz Maximilan Troost who were both in charge of spare parts supply in their respective units. Original orders also confirm this system:

The order from AHA/In 6 (IV a) HM No.142 from 9 March 1937 underlines that spare parts were obtained on the open market:

> *The Panzer regiments and reconnaissance Abteilungen must not procure the glass blocks for vision slits from local dealers on the spot or wholesalers, but must exclusively be supplied from the Firma Roehm & Haas A.G., Darmstadt. It is planned to have replacement glass blocks available at the H.Za. Magdeburg in the future. This order is only effective until the H.Za. Magdeburg is able to deliver glass blocks on request. ...*

> *In case the remote thermometers installed in Pz.Kpfw.1 (M.G.) need to be repaired, they must not be sent to any small company or dealer but exclusively to the Firma A. Emil Bäder, Düsseldorf.*

Under No.61 an order was released in the motor technical appendix of the 'Heeres-Verordnungsblatt' on 13 July 1939 that reminded the manufacturers that it was forbidden to hand out spare parts to pick-up detachments. The quotation: "difficult spare part supply situation" drove certain units to send pick-up detachments all across the Reich to pick up spare parts directly at the manufacturers. However, buying spare parts at companies in the immediate vicinity of the unit's headquarters was not prohibited by that order.

The spare parts list for the Low-bed Trailer for Pz.Kpfw. (Sd.Ah.115) (10t) (D 617/2) from 31 August 1940, stated that spare parts request could be addressed to:

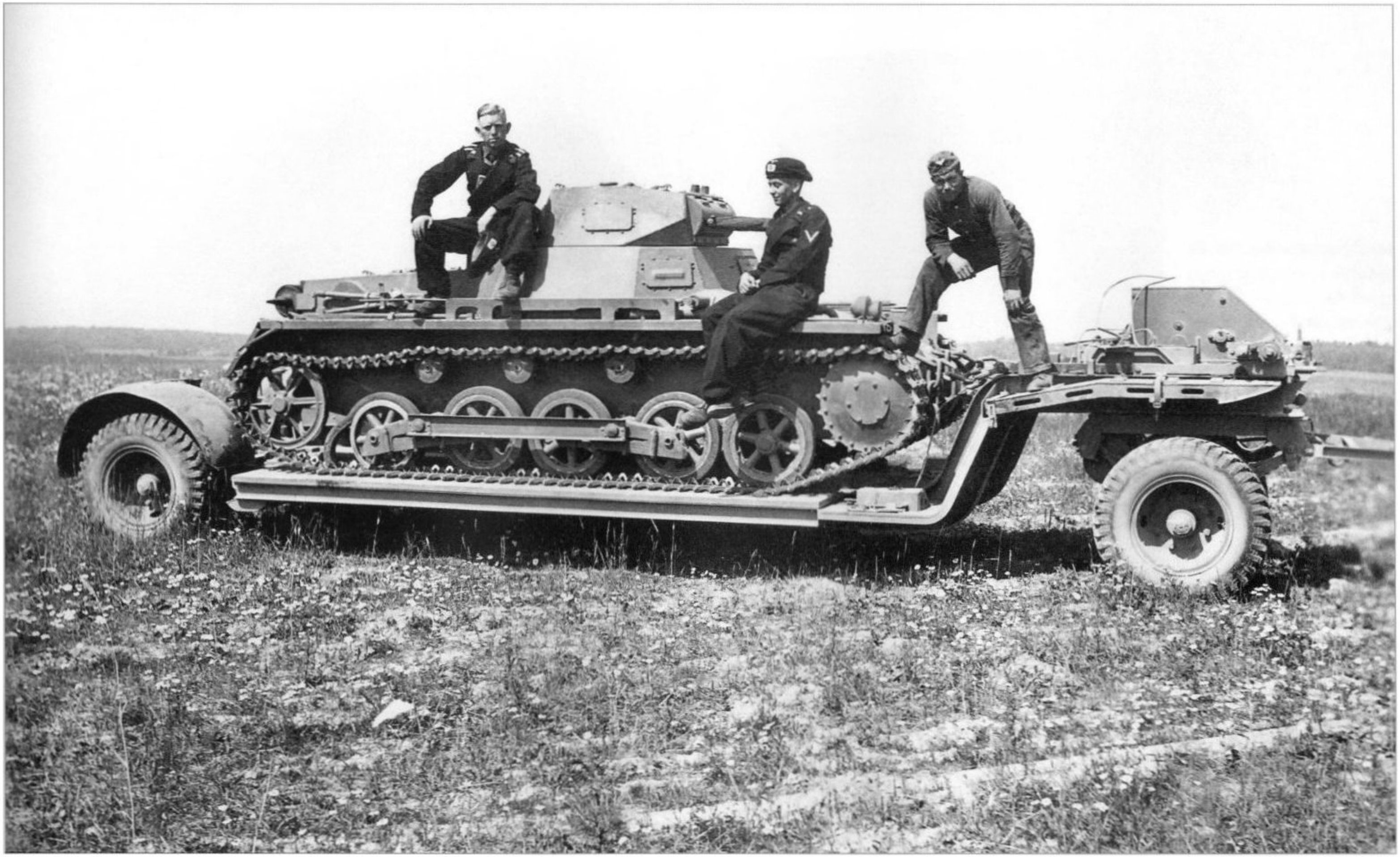
> *a) Waggon- und Maschinenfabrik Bautzen*
> *b) Rober Schenk, Waggonfabrik, Stuttgart-Feuerbach*
> *c) Gottfried Lindner, Ammendorf b. Halle*
> *d) Waggonfabrik Gotha, Gotha*
> *e) Waggongabrik Steinfurt, Königsberg i. Pr.*

During mobile employment though, the 'special regulations for spare part supply' applied. Then, as of 19 September 1941, all spare parts for the low-bed trailers for Pz.Kpfw. (Sd.Ah.115)(10t), (Sd. Ah.116)(20t) and (Sd.Ah.116)(22t) for field units had to be ordered from the H.Za. Magdeburg through the assigned advanced Panzer spare parts depot (AHM No.90, 19 September 1941, effective immediately).

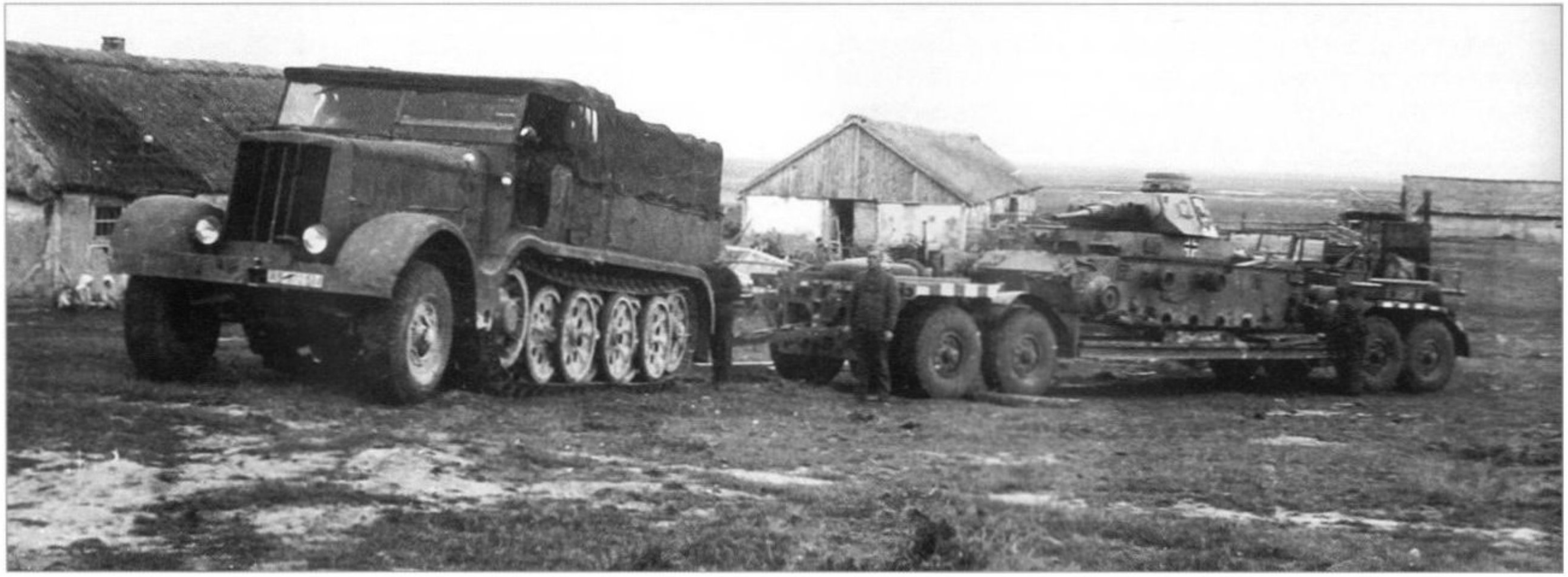
Franz Maximilan Troost, in action with Pz.Abt.67 of 8.Panzerdivision, wrote after the war:

> *In peace time the spare parts came from the Zeugamt. After the Polish Campaign, we bought small parts on the market; only big parts came from the Zeugamt. Almost daily I drove to Berlin to get new parts. During the Yugoslavian Campaign I only picked up a radiator in Austria. Back in Prague, the repair work started immediately. We picked up parts for the Pz.Kpfw.38(t) directly at the manufacturer. The other items I bought on the market. For the Henschel Lkw Typ 33D1 I had to drive to the manufacturer in Kassel. At first they did not want to give me anything out of the production. For the Pz.Kpfw.IV we did have spare parts.*
>
> *We had just six weeks until we loaded for East Prussia. As part of H.Gr. North we procured spare parts from Riga, later as part of H.Gr. Middle from Minsk. The trains to Riga were no problem, but the trains towards the front were always full, so that we had to march on the road.*
>
> *At the workshop company we had seven trucks for spare parts. Six of those were full with tons of material and one was to procure new parts.*
>
> *The stretch from Orel and Brjansk to Minsk was partisan territory. To drive from Bobruisk was only permitted if you had five men with carbine and one machine gun or ten men with carbine. The 110km from Sluck to Minsk could only be driven in convoy. A Panzer in the front, then approximately eight vehicles and a Panzer at the end. This convoy left every day at eleven o'clock from Minsk to Sluck and back at 2 o'clock in the afternoon.*
>
> *In France, most of the engines were sabotaged and broke-down shortly. In Riga we never had problems because the people were German friendly.*

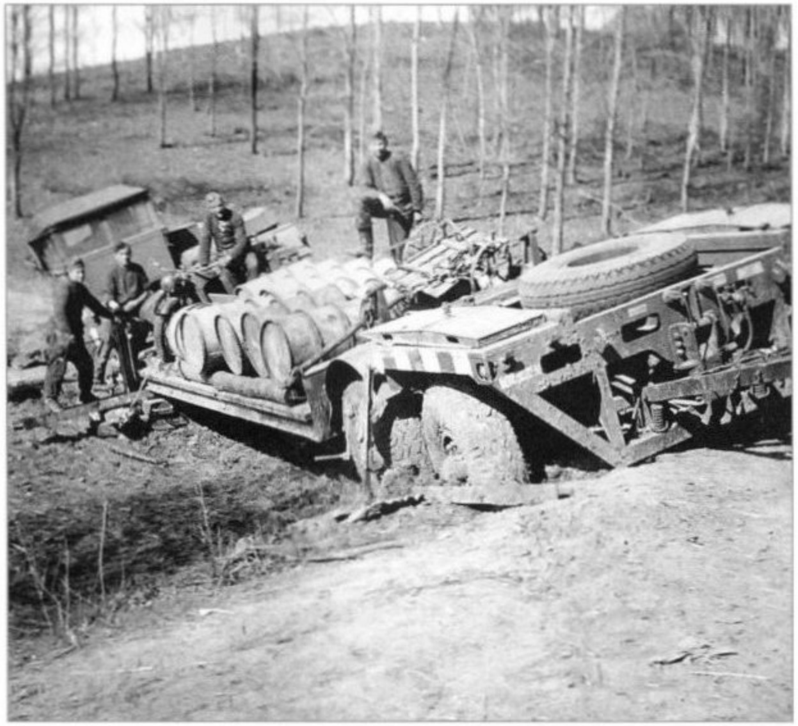
According to Luckner, 'Wehrmachtseigene Lager' [the correct designation is 'Wehrmachts Ersatzteillager'] only existed for the three Wehrmacht types on Einheits-Fahrgestell (standard-chassis): l. gl. Pkw (Kfz.1), s. gl. Pkw (Kfz.15) and l. gl. Lkw. (2,5t). These WEL handed out spare parts without payment. However, by June 1939, the depots for the l. Lkw were not ready yet and the spare parts for chassis built by Daimler-Benz had to be supplied at Büssing-NAG in Braunschweig (Luckner).



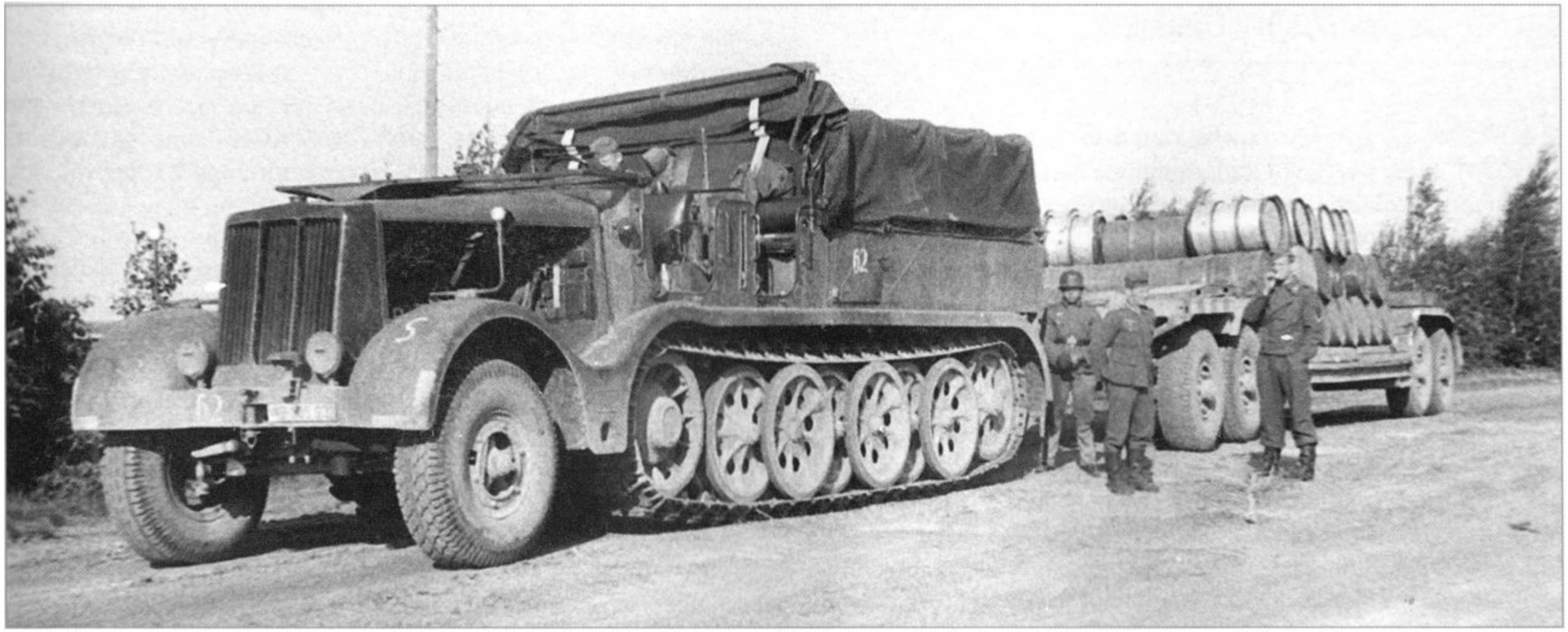
▲ This is the rare 8to version of the Sd.Ah.115. It is easily distinguishable by the covered winch above the front axle and the different, single piece loading bed which could not be partly raised as the one of the 10to version. It carries a Pz.Kpfw.I (M.G.) (Sd.Kfz.101) Ausf.B. *JH*



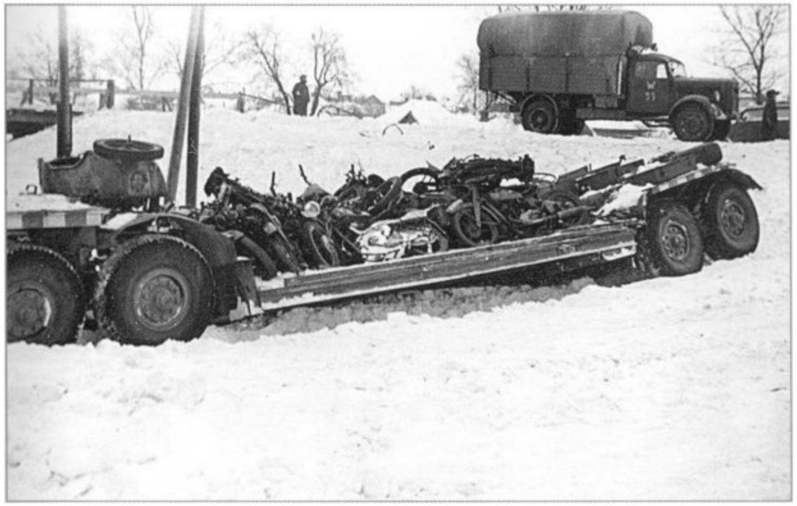
▶ The remains of a Pz.Kpfw. III Ausf.H. are taken away by a s.ZgKw.18t (SdKfz.9). Note the light color of the road wheels. The contrast is so strong that they might be replacements which were already delivered in the new dark yellow paint. *AMC*



▶ Recovery units with their half-tracked vehicles were sometimes deployed to supply combat units that lacked transport capacity, either because they did not have enough trucks or they could not get through the mud. *AMC*



◀ During the mud period, the supply of a division was often limited to their few tracked and half-tracked vehicles. On 1Feb44, 3.Pz.Div. reported that its supply routes for spare parts were partly up to 7,000km. Thus supply was delayed up to 6 weeks. *JH*



▲ Motorcycles and sidecars are evacuated on a Sd.Ah.116. Many experience reports from Russia held that the units would like to substitute all motorcycles with VW-Kübelwagen. Motorcycles were essential to deliver orders and other messages. *JH*

▲ This photo shows the Wkst.Kp. of StuG.Abt.210 relocating from Saporoshje to Borrissowka, in the direction of Nikopol. *JH*

No Stock: Necessary Changes

The Kfz.-Parke, that were to be raised in case of war, received an initial stock of - nothing! Additionally, statistics about the consumption of spare parts were missing. Due to the decentralized supply, nobody calculated the run rate (Luckner).

During the Polish Campaign the spare parts supply was based solely on the stock of the dealers in the deployment area. Therefore, in June 1939, the OKH/In 6 collected lists from all divisions about their Kfz stock indicating type and make. These documents were then sent to the Wehrkreiskommandos in the deployment area which effected the stockpiling of the stock of the local dealers and if necessary, granted credits (Luckner). The troops ordered their parts from the 'Beschaffungsgruppe' (supply group) of the Heimatkraftfahrpark. These HKPs in turn ordered from the dealers which supplemented their stock from the manufacturers.

Schell wrote in September 1942 about difficulties in the Polish Campaign:

> *It was difficult if not impossible to equip all maintenance facilities with the necessary spare parts, because they either had to be procured on the open market (which was not prepared for such a rush) or directly from the manufacturer. The idea of Zentralersatzteillager (centralized spare parts depot, or ZEL) was still under development.*

The deployment in the West overburdened the local HKP completely since they were not allowed to keep a larger stock themselves. To secure the supply in the area of operation, the OKH/In 6 formed centralized spare parts depots. They supplied the units within a H.Gr. Due to the lack of regulations, the internal organization and operating schedule was left to the initiative of the individual commanders. The commanders were almost exclusively reserve officers from the auto industry who adapted the organizational structure of their parent company. So one ZEL functioned like the company Opel, another like Daimler-Benz, etc. (Luckner).

The flaws of this system did not show themselves or only showed themselves later during the campaigns. However, the time between campaigns allowed the supply of the necessary spare parts and replenishment of vehicles. Only the Russian Campaign with its constant wear on vehicles and men manifested its flaws. These were according to Luckner:

- *Faulty calculation of the spare part needs (knowledge about the real wear of the individual vehicles was missing; the orders for spare parts were so high that they seemed unbelievable).*
- *Inconsistent and faulty calculation of the vehicle stock.*
- *Time consuming supply routes. Spare parts were ordered by the front ZEL from the Heimat-ZEL and by the Heimat-ZEL from the manufacturer. Due to this, time was lost and a large number of parts were 'in transit'.*
- *Missing specialized workshops in the area of operations which could have repaired the handed-in replacement devices quickly. The damaged devices were returned to the workshops in the homeland. Because of the long transport distances, the stock of such replacement ready devices was low.*
- *Insufficient transport organization. Most of the trains going to the front carried expendable goods, such as fuel, ammunition and provisions. Spare parts were only transported in single wagons, attached to the trains.*
- *Absence of a central administration which had the authority to:*
    1. *Work out spare part supply programs with the manufacturers in the long run.*
    2. *Establish an exchange organization for devices and single parts.*
    3. *Guide the 'Engpassteile' (shortage parts) in accordance with urgency.*
    4. *Balance the stock between the different ZEL.*
    5. *Compile spare parts lists that indicated all possible manufacturers and if parts could be used in different vehicle types, etc.*

A slightly different form of organization existed for 'Austauschbaugruppen' (exchange components), such as engines, transmissions, generators, fuel injection pumps, etc. These components were not used but came back to the workshop in a different state. The troops exchanged old for new. Workshops were established at the HKP or ZEL to repair the exchanged components closer to the front. The workshops could specialize in a specific type or make. At the same time, workshops in the homeland were converted to exclusively repair exchange components, which were supervised by the parent company. Engines and transmissions which could not be repaired by the troops' workshops had to be exchanged at the assigned Panzer spare part depot. New components could only be received with exchange (Chef Inst. III, AHM No.13, 15 December 1942).

To show the size of this system, Luckner gave the example of ZEL I, Warschau, which had 2,400 engines repaired ready by January 1944 or the K-Werk Minsk having a running stock of 1,600 engines, 480 transmissions, 160 steering gears [no date] or Ford in Köln which had 1,400 type V8 and BB engines for general overhaul per month.

◀ Workshop trucks were precious; this one was disguised as an ambulance to avoid attack. France 4 July 1944. *NARA*

Planning and Production

The supply of spare parts was the responsibility of the Kfz.- and Kfz. part manufacturers and the Spezial-ZEL. The Kfz.- and Kfz. part manufacturers were also responsible for the production of spare parts and reported to the 'Ersatzteilbeauftragten des OKW'. The highest command had the 'Ringleiter für die Ersatzteilfertigung beim Rüstungsministerium Speer'. As a basis for the planning of the total need only the stock record cards of the firms and Spezial-ZEL existed. Other documents were not available. To secure the spare parts, the 'OKW/Chef Instandsetzung' obliged the manufacturers through contracts to assess the demands on time, request the necessary contingents from 'OKW/Chef Instandsetzung', manufacture the parts in-house, stock them, and deliver them according to the orders of Chef Instandsetzung (Luckner).

To increase spare part production and to avoid that this increase hindered the series production, the manufacturers built extensions and for this were supported by the government in the context of the 'Adolf-Hitler Panzerprogramm'. The Waffenamt WuG 6 wrote a status report about the spare parts situation of Pz.Kpfw.III and IV and low-bed trailers to the Chef H Rüst.u.BdE on 24 April 1940:

> *To guarantee spare parts supply for Pz.Kpfw.III and IV, the Waffenamt took extensive measures that led to a significant increase in spare part production. It has increased from 39.3to in September 1939 to 142.5to in February 1940, which equals an increase of 240% within the first six months of war. The output of spare parts will always be subject to certain variations, depending if in a month more large and simple, or more small and premium, parts are manufactured.*
>
> *This strong increase made it possible that, after the Polish Campaign, all Pz.Kpfw. could be repaired within a few weeks, even though most of them needed a complete overhaul, and therefore the needed spare parts could be provided, whereas only a minor interference with the series production was necessary. The Waffenamt seeks a further increase by constructing more*

manufacturing plants at the companies Vomag, Steyr, MIAG and Humboldt-Deutz. The first three factories have just started to be built.

The WuG complained that it was not served with long-term orders from the AHA (Fz.-In) to guarantee a fast output of spare parts. So far the AHA (Fz.-In) refused to do so for the reason that all orders sent to Wa JRü (WuG 6) up until 1 April 1940 represent the total need of spare parts of all currently ordered Pz.Kpfw. for two years. The AHA based its calculation on the experiences of the Polish Campaign and thus declared that "even considering several new deployments of the Panzertruppen new, large orders will not be necessary before the course of 1941 ...". The AHA added as a further explanation that "the current orders for spare parts will be fulfilled by the end of 1940 when a larger part of the Pz.Kpfw., for which the spare parts are designed, will not yet be delivered. The production of spare parts for a two-year-need within one year cannot be justified."

Without continuous large orders by the Fz.-In, increased production was doomed to stall. The start-up at the manufacturers would then again cost a lot of time when new orders were placed in the future. In the same report, the Waffenamt stated that: "the supply of spare parts for wheeled vehicles was incumbent on the Heimatkraffahrparks. The Heimatkraftfahrparks receive a contingent from the AHA, out of which they order the spare parts from the manufacturers. The responsibility of spare parts supply for wheeled vehicles lies with the AHA as the superior of the Heimatkraftfahrparks."

Besides the regular production series contracts, armor manufacturers signed separate contracts for spare parts. The following notes from a board meeting of Daimler-Benz on 23 October 1941 show the view from the side of the producer:

Status of the Wehrmacht duties and situation in the individual Werke:

▶ Transmissions produced by Zahnradfabrik Friedrichshafen (ZF) until the end of 1943.

Transmission/Vehicle	> 1938		1939		1940		1941		1942		1943		Total	
	Series	Spare	Series	Spare	Series	Spare	Series	Spare	Series	Spare	Series	Spare	Series	Spare
FG 35. Pz.Ia	1350	134	...	69	...	2	...	75	...	100	...	150	**1350**	**530**
FG 31. Pz.Ib	1036	84	...	25	...	...	...	78	...	25	...	175	**1036**	**387**
SSG 45. Pz.II	268	50	...	10	...	64	...	2	...	...	...	...	**268**	**126**
SSG 46. Pz.II/Sfl.	970	43	...	92	60	151	387	104	577	126	424	92	**2418**	**608**
SSG 47. VK1601/1801	...	...	...	...	27	...	40	...	20	20	...	...	**87**	**20**
SSG 48. VK1303 (Leopard)	...	...	...	...	...	...	...	...	48	...	101	16	**149**	**16**
SSG 75. Pz.III/IV	92	8	...	3	...	2	...	26	...	...	...	...	**92**	**39**
SSG 76. Pz.IV	190	23	147	45	278	19	546	168	1155	104	3164	175	**5480**	**534**
SSG 77. Pz.III/St.Gesch.	...	...	...	...	873	38	2343	483	3318	430	3448	478	**9982**	**1429**
AK 7-200. VK3002 (Panther)	...	...	...	...	...	...	...	...	61	...	2052	91	**2113**	**91**
12 E 170. VK4501 (Tiger)	...	...	...	...	...	...	...	...	2	...	1	...	**3**	...
VG 14479. Pz.II/Sfl.	93	...	3	8	...	...	108	35	42	199	...	...	**246**	**143**
VG 328145. Pz.III	23	...	213	10	833	182	...	44	...	...	...	...	**1069**	**236**
Total	**4022**	**342**	**363**	**262**	**2071**	**458**	**3424**	**1015**	**5223**	**905**	**9190**	**1177**	**24293**	**4159**

> *All spare parts delivery go to the Zeugamt Magdeburg, from where the Armeen are served. The reason for this central distribution is to prohibit units from excessively soaking up spare parts.*
>
> *Despite the Heereswaffenamt being advised by us constantly, it did not purchase enough spare parts in a timely manner. Because of this we are now facing these enormous requests of Panzer spare parts up to an amount of 100 million Reichsmark. The series production shall thereby not be affected despite the existing difficulties in regard to labor, machines and material everywhere.*
>
> *Despite all those difficulties, our firm still delivered well, namely 206 tons in the last month.*
>
> *The Ostwerk Königsberg shall primarily be occupied with the repair of Panzerwagen and with the manufacturing of spare parts only as far as machines are therefore available. To increase the output of repaired vehicles an additional hall has been rented in Königsberg.*
>
> *The series production of Zgkw. was on S-level while the spare parts production was only on A-level. This was unacceptable and they are now both on the same priority level as Panzerwagen. To increase the production though, the necessary laborers and machines are not available.*

The history section of the Daimler-Benz webpage notes that, in January 1941, a third of the capacity of vehicle production was busy with spare parts manufacturing.

The A-level used to be the highest priority level for war material until the S-level and later the SS-level ('Sonderstufe') was introduced as an even higher priority. In a notice of Rü II, No. 470/42 gKdos, 20 February 1942, the Pz.Kpfw.II, III, IV and 38(t) were on SS priority level same as were spare parts for Pz.Kpfw. and maintenance. Stu. Gesch. (7.5cm K.Sfl.), Pz.Spähwagen and all other gep.Kpf. as well as Zgkw. with spare parts were priority level S.

Information about spare part production is scarce. M.A.N. reported a total delivery of Maybach HL 120 TRM engines in 1944 as 2,229 of which 366 were sent to a Heeres-Zeugamt and 1,863 were sent directly to Niebelungenwerk, Vomag, Krupp-Grusonwerk, Alkett and MIAG. This amounts to roughly 16% of the total production being delivered as replacement engines in 1944.

The overview of transmissions produced by Zahnradfabrik Friedrichshafen (ZF) on the opposite page shows that no consistent percentage of spare transmissions was manufactured. It also proves that in contradiction of certain myths spare transmissions were already being produced before the war started.

According to Schell, 1963, in peace time and at the beginning of the war, it was reckoned that 10% of the charge weight of vehicles was needed for spare parts. This amount was a priori taken in account when raw materials were assigned. Because of the necessity to also keep the oldest models running, in the middle of 1942 this number had grown to 40% of the charge weight.

Because older vehicles are kept in service, it is not sufficient when spare part production is kept at a steady proportion to the series production. A rough calculation (see next page) shall demonstrate the result if spare part production is kept at a steady 15%, here we take spare engines. We assume the losses keep being 10% of the vehicles in service and that a vehicle is a total loss when it does not have its engine replaced. In the first month, all vehicles can be repaired and 5% of spare engines can be held as reserve. In the second month, the losses are already higher than spare engines produced, but because a reserve could be built in the previous month, all vehicles can be repaired and no losses occur. In the third month however, already more vehicles break down than spare engines are available, even though the production is still kept at 100 vehicles and 15% spare engines per month. After six months, the tank production of a whole month has been lost due only to the lack of spare engines. In reality, the result would be even worse because the break-down rate of old vehicles also rises with time.

It could not be established if Germany constantly calculated a fixed percentage of spare parts independently of the series production and thus made a conceptional mistake in thinking. That no such document was found leads to the conclusion that no fixed percentage was used. Reports from the Waffenamt indicate that with the increase of Panzer production it tried to raise spare parts production at least as much or even more (see below, Heereswaffenamt 24 January 1942).

On 21 December 1943 Speer made it clear that spare part production needed to be maximized independently from the 'Neufertigung' (new production). On that date he wrote a letter to the manufacturers of Panzer engines, transmissions, final drives and sub-elements saying:

> *The intensity of the battles at the front requires the complete deployment of all Panzerkampfwagen and Sturmgeschütze.*
>
> *To completely utilize and maintain the combat readiness of the vehicles, the production of spare engines, transmissions and final drives as well as the production of the therefore necessary spare parts independent from the 'Neufertigung' need to be raised to the highest degree.*

In the same letter Speer ordered his 'Ersatzteilbeauftragter' (spare parts representative), Dipl.Ing. Östreich, to initiate the necessary preparations in cooperation with the 'Panzerbeauftragten' (Panzer representative), the 'Hauptausschuss Panzerwagen' (main panel Panzerwagen), the 'Heereswaffenamt' (army ordnance office) and the relevant companies. Until further notice Speer gave priority to the necessary measures for spare part production over the measures necessary for an extension of the Panzer production.

On 24 January 1942 the Heereswaffenamt noted on the production of Pz.Kpfw. spare parts:

> *Since the beginning of the war, the spare part production became constantly more significant. The 'Amt' had the duty to boost the spare parts production besides the regular production of complete weapons and vehicles in the same or even higher extent. Thereby one often had to counter the danger of the lag of spare parts production against the ever increasing series production. Because of its special importance, the development of Pz.Kpfw. spare parts production during the war shall be shown in the following: ...*
>
> *The considerably increased need for spare parts during the war could be satisfied overall. The intermittent peak demand, which occurred during the campaigns, was first met by falling back on the stock. The total requirements for spare parts were increased by the following factors:*
>
> 1. *In Summer 1941 the Balkan Campaign made exceptional interventions in the spare parts production necessary. After its end all Pz.Kpfw. needed extensive repairs.*
> 2. *The Eastern Campaign put the Industry in a completely new position.*
>   *a. The long distances that had to be crossed resulted in request for suspension parts (especially road wheels) in numbers never reached before. With the available amount*

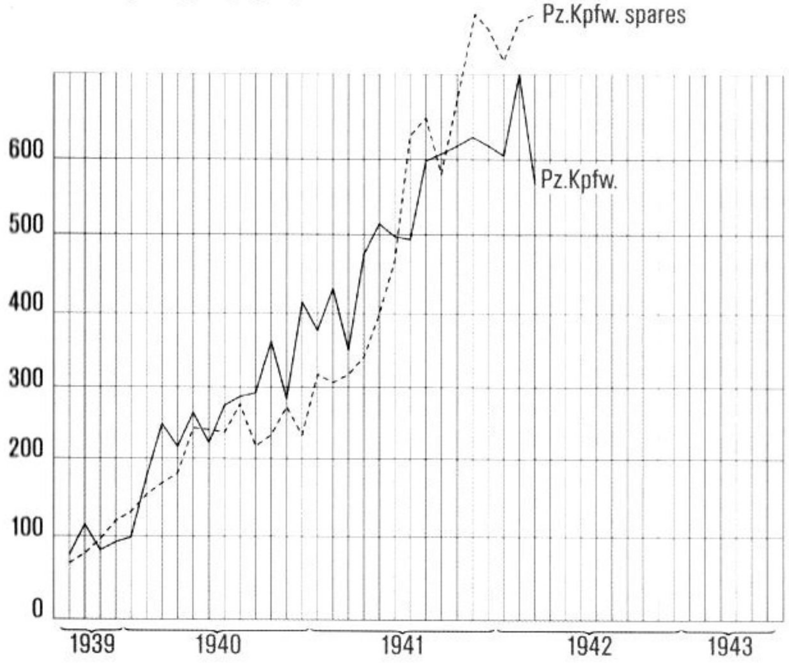
	Vehicles Produced	15% Spares Produced	Total Spare Engines	Total Vehicles at the Front	Losses 10% Total per Month	Operational Vehicles Left	Spare Engines Left	Lost Vehicles each Month
1 month	100	15	15	100	10 vehicles	100	5	0
2 month	100	15	20	200	20 vehicles	200	0	0
3 month	100	15	15	300	30 vehicles	285	0	15
4 month	100	15	15	385	39 vehicles	361	0	24
5 month	100	15	15	461	46 vehicles	430	0	31
6 month	100	15	15	530	53 vehicles	492	0	38

▶ This hypothetical table shows that a constant percentage of spare parts results in losses - quickly.

of rubber it was not possible to fulfill the requirements of the troops.
b. The dust wore the Panzer engines down to such an extent that series production had to be interrupted to meet the immediate troop requests of replacement engines. Added to this was a considerable request from the Afrika Korps. The wear of Pz.Kpfw. is much faster in the desert than in any other campaign.

In response to the increased demand, the industry gives the following difficulties in production:

- *The subcontractors do not deliver the material on time;*
- *Laborers were taken away from the subcontractors;*
- *Transport difficulties: The Reichsbahn considers the transport of material from one subcontractor to the other not as a Wehrmacht's but a private good's transport;*
- *Lack of laborers;*
- *Lack of machine tools;*
- *Deprivation of mechanical production in favor of 'Neufertigung' [sic].*

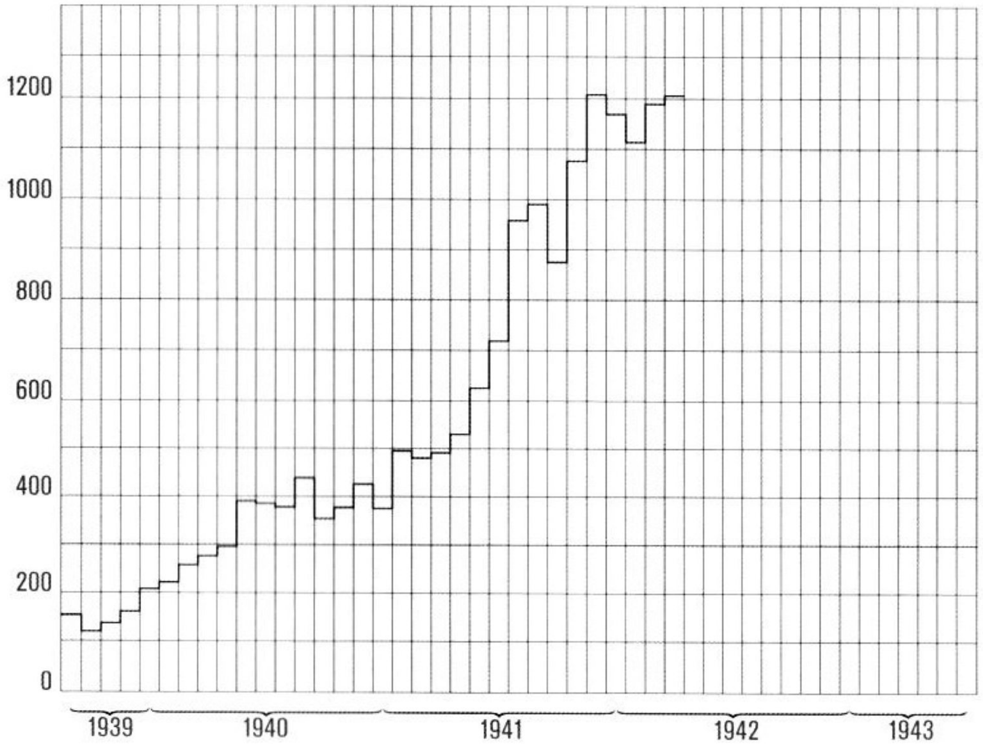


◀ Pz.Kpfw. spare parts production in tonnes. *Re-drawn by Daniel Jurt.*

Even though the total request could be met in general, despite the increased demand and the difficulties in production, the danger of a considerable shortage in the near future exists. The Amt is anxious to avoid such a shortage as far as possible.

1. ***Pz.Kpfw. Production***
   The production of Pz.Kpfw. has increased during the war from 52 Panzers a month in September 1939 to almost 400 Panzers at the end of 1941, so almost eight times as many. The last increase before the Russian Campaign evoked the highest possible utilization of the already available production capacities and laborers.

   A breakdown of the total production to the individual Panzers gives the following picture:



▼ Pz.Kpfw. and spare parts production shown by means of index numbers. Sept. - Oct. 1939 = 100. *Re-drawn by Daniel Jurt.*

Pz.Kpfw.I
Only sporadic output because production has been stopped.

Pz.Kpfw.II
Production has been increased again since January 1941 to 37 piece in September 1941.

Pz.Kpfw.III
The lion's share of production is allotted to this vehicle. More than half of all Panzers produced are Pz.Kpfw.III (including the Stu.Gesch.Gesch. with 30 - 50 monthly). The production of Pz.Kpfw.III has increased from 40 vehicles in September 1939 to 252 vehicles in November 1941, so more than six times as many. The development corresponds with the general increase of total production.

Pz.Kpfw.IV
The Pz.Kpfw.IV is represented in the total production with only 20 - 40 vehicles per month.

Pz.Kpfw.38(t)
The production of this Pz.Kpfw. gains in importance. Production has increased from January 1941 - September 1941 from 45 to 76 vehicles a month.

Pz.Bef.Wg.
The Pz.Bef.Wg. only has minor relevance in the total production.

2. ***The Pz.Kpfw. Spare Parts Production.***
   Like Panzer production, the production of spare parts increases considerably from year to year. In 1940 spare parts production received a considerable boost from the demands of the French Campaign. A special plan to increase production further was made for 1941. The actual production was more or less within the prediction until April 1941. Due to the supply requirements for the Balkan, the African and Eastern Campaign, the spare parts production received a considerable boost since May 1941 to almost 1,200to in December 1941. ... There is no special plan for 1942. The spare parts production shall simply meet with the highest production capacities possible.

3. ***Spare part production for individual Pz.Kpfw. types***
   The need for spare parts is especially high for Pz.Kpfw.III and IV. As measured by the total stock of Panzers, the spare part requirements of Pz.Kpfw.IV are 2 - 3 times as high as those for a Pz.Kpfw.III (including Stu.Gesch.). The spare part requirements for Pz.Kpfw.II have decreased since June 1941. In correlation with its use, the Pz.Kpfw.I needs the fewest spare parts.

4. ***Comparison of the Development of Pz.Kpfw. and Spare Part Production***
   The graph of production of spare parts and of complete Pz.Kpfw. show more or less the same development. They both rise quickly in the period from September 1939 - August 1940. Then the spare part production falls slightly behind the production of complete Pz.Kpfw. because the request between French Campaign and the Balkan Campaign drops as well. Starting in April 1941 spare part production increases faster than the one of Pz.Kpfw. because of the summer offensive. Both graphs cross in July 1941 and since August 1941 the spare parts production is relatively higher than the production of complete Pz.Kpfw. Since the start of the Eastern Campaign until November 1941 spare part production almost doubled.

The Adolf-Hitler-Panzerprogramm also included expenditures of several million 'Reichsmark' to the manufacturers in several steps for spare parts production and maintenance.

Böhm. Mähr.-Maschinen Fabrik, Schlan	*Spare parts 38t*
Daimler-Benz, Berlin	*Spare parts Pz.III*
Krupp-Gruson, Magdeburg	*Spare parts Pz.IV*
M A N, Nürnberg	*Spare parts Panther*
Masch. Fabr. Meer, Mönchen Gladbach	*Spare parts Pz.III*
Krupp-Druckenmüller, Berlin	*Instandsetzung*
Klöckner-Humbold-Deutz	*Instandsetzung*
H. Rüter, Hannover	*Instandsetzung*

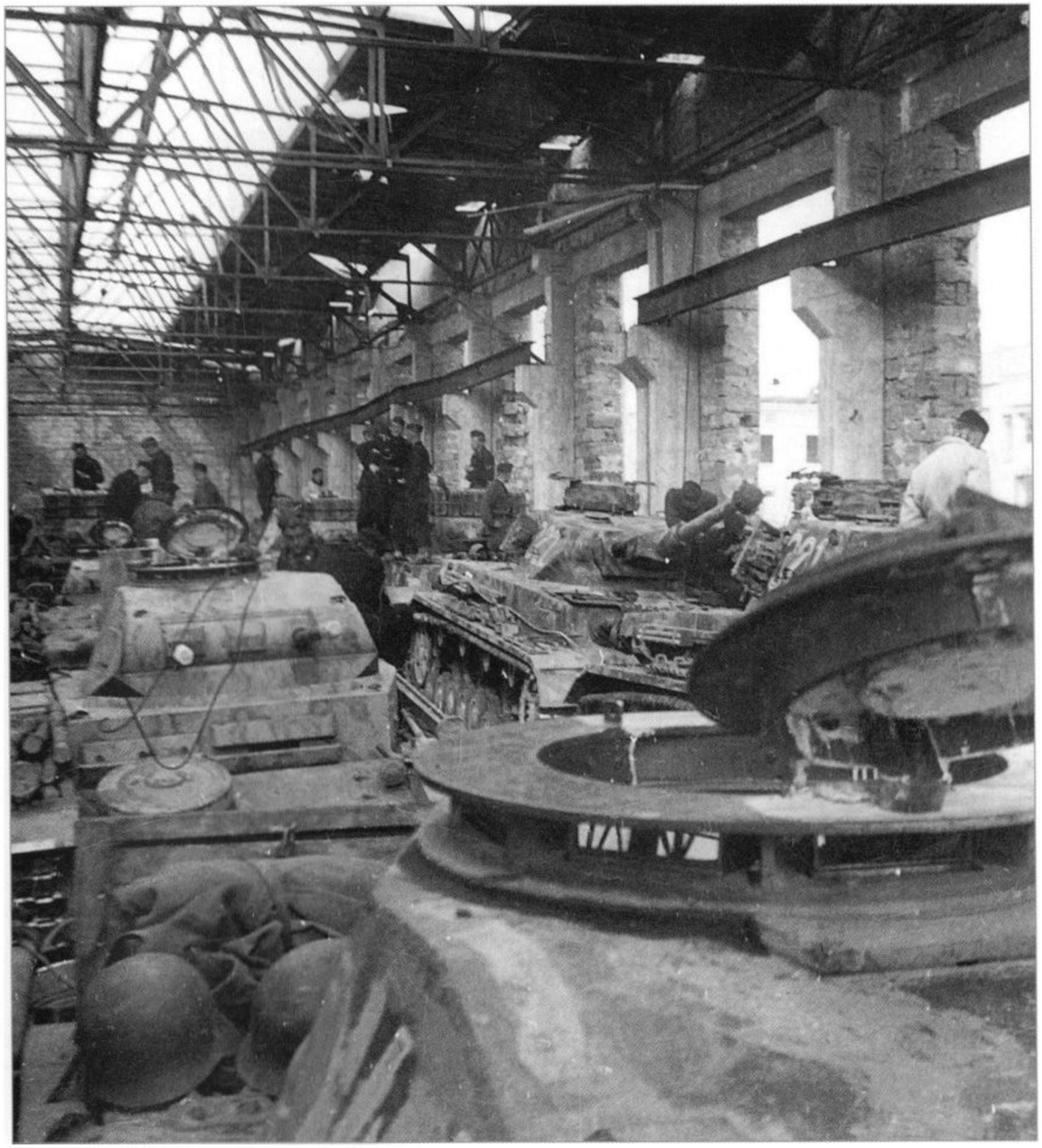
A report that pointed out the missing spare parts production capacities comes from a meeting of the 'Panzerausschuss' on 18 pril (Speer protocols, 22 April 1942) and states:

Ersatzteile
Director Oberländer describes the difficult spare parts supply situation for the deployed Panzerkampfwagen, which was exacerbated by the air raid damage in Paris, passive resistance of the Frenchmen, sluggish deliveries of material and financing matters in Romania. ... Since the demand for spare parts keeps increasing exponentially with the continuous time of deployment the situation becomes more and more difficult. If we do not insist to build new, sufficient spare part capacity, the time will come when we will not be able to manufacture a single complete Kampfwagen in order to satisfy the spare part demands.

A new spare part factory with about 20,000 square meters covered area and 800 - 900 machine tools, 1,000 productive and 250 unproductive [administrative ?] *workers is demanded as the first stage of development. Construction volume for this is about 5 million RM and 10 million RM for machinery.*

As an immediate measure, the 'Rüstungsdienststellen' are ordered to suggest suitable capacities and spare part manufacturing, e.g. in decommissioned textile mills etc., in which the location should not be too far away from the Panzer manufacturers. The necessary machines must be combed out of less important companies. In the meantime, a second and, if possible, third shift must fully run in all existing plants, though this depends on the sufficient assignment of workers. The employment of labor situation is very unfavorable.

It was decided that the new production of complete vehicles is not further raised in favor of spare parts production, and to assign additional labor exclusively to spare part production for the time being. A proposition to the 'Führer' will be made to decrease [sic] the output of complete vehicles in favor of spare parts.



▲ Pz.Kpfw.II Ausf.F with cupolas and dummy visors, and Pz.Kpfw.IV (the Pz.Kpfw.IV with jerrycans on their roofs are short barreled Ausf. F) are assembled in a conquered but destroyed hall. Craig Ellis identified these as belonging to the 22.Pz.Div. *ØL*

Panzer Spare Parts Depot

For Panzer spare parts there existed Panzer-Ersatzteillager. The Pz.Wkst.Kp. of the Panzer regiments, the independent Pz.Wkst.Kp. and the Pz.Inst.Abt. obtained their spare parts and exchange components from the Panzer-Ersatzteillager subordinated to the H.Gr. or from the advanced supply points ('vorgeschobenes Ersatzteillager') established by the Panzer-Ersatzteillager. The Panzer-Ersatzteillager received their stock from the Heeres-Panzerzeugämter in the homeland.

On the day before operation 'Barbarossa', on 21 June 1941, the Chef H Rüst.u.BdE gave an overview about the Panzer spare part situation. Unfortunately, he did not list their actual location.

I. Stock in the Eastern- and Southeastern Depots as of 15Jun1941

Pz. Ersatzteillager A (so far O.Qu. Rumania)

The depot is transferred to Warsaw and used to supply Pz.Gr.2. After clearing the stock with Lager C (38t), the estimated stock of German Panzers will be ca. 600to.

Pz. Ersatzteillager B

Stored approximately 600to.

Pz. Ersatzteillager C

After clearing with Lager A, ca 300to.

Pz. Ersatzteillager D

Stored 450to. A transport with 70t spare parts 38(t) will be added on 23 June 1941.

The situation regarding main expendable parts ('Verschleissteile') and 'Engapssteile' (bottle neck parts) remains unchanged in all depots.

II. Stock in H.Za. Magdeburg-Königsborn

The stocks in H.Za. Magdeburg remain unchanged, because the new entries from the production could only cover the deliveries for the replenishment of the Pz.-Divisions, for the Afrika-Korps, as well as a minimal stock for the troops.

III. General Pz.-Spare Parts Situation

A stockpiling and concomitant replenishment of the advanced depots is only possible when the ... requested monthly productions are met. The extensive use of French Beute-Panzerwagen and gep.Mun.Schleppern in the army shows considerable difficulties of spare parts supply already. There are no Panzer spare parts in stock for the units in the East which are equipped with French Pz.Wg. or Schleppern. The small stocks for parts have been completely consumed for maintenance. ...

In 1942/43, among others, a Panzer-Ersatzteillager was located in the immediate vicinity of each of the three Panzer-Instandsetzungs-K-Werke: Minsk, Dnjepropetrowsk and Riga. For later in the war the following overviews of Pz.Ersatzteillager could be found in the NARA and BArch-MA:

Summer 1943	Jan.1944	Oct/Nov. 1944	Dec. 1944
Pz.Ers.L. A	Pz.Ers.L. A	Pz.Ers.L. A [H.Gr. North/ Braunsberg]	Pz.Ers.L. A
Pz.Ers.L. B	Pz.Ers.L. B	Pz.Ers.L. B [H.Gr. A / Frankstadt b. Olmütz]	Pz.Ers.L. B
Pz.Ers.L. C	Pz.Ers.L. C	Pz.Ers.L. C [H.Gr. Middle/ Obernigk]	Pz.Ers.L. C
Pz.Ers.L. D	Pz.Ers.L. D	Pz.Ers.L. E [H.Gr. C / Bruneck (Tirol)]	Pz.Ers.L. D
Pz.Ers.L. E	Pz.Ers.L. E	Pz.Ers.L. F [H.Gr. D / north of Wiesbaden]	Pz.Ers.L. E
Pz.Ers.L. F	Pz.Ers.L. F	Pz.Ers.L. H [H.Gr. F]	Pz.Ers.L. F
Pz.Ers.L. H	Pz.Ers.L. H	Pz.Nachs.Lager K [H.Gr. South]	Pz.Ers.L. H
Pz.Ers.L. Ob. West	Pz.Ers.L. J	OKH K South	Pz.Ers.L. K
Pz.Ers.L. West		Pz.Ers.L. D [Ob. West] raised by Oct./Nov.	Pz.Nachsch. Staffel Nord
			Pz.Nachsch. Lager J

How to Order Spare Parts

How spare parts were to be ordered was described in the Guideline for Troop Engineers from 12 August 1942:

> *Spare parts for wheeled vehicles and Zgkw. (Panzer- and tracked vehicles excluded) are requested from the I-Gruppen, through the I-Staffel at the Wkst.Kp. in exchange for the old parts. If a part is not in stock, one must try to obtain it at the next Ersatzteil-Staffel, ZEL, AKP or HKP. Freelance supply in the homeland is forbidden. Vehicles possibly sent off can be confiscated. Spare parts for Pz.Kpfw. are supplied at the next Panzer-Ersatzteillager by the Pz.Wkst.Kp. If they are not in stock, they are directly requested and supplied at the H.Za. Magdeburg. ... Paints are generally obtained from the ZEL.*
>
> *The spare part request has to include the kind of vehicle, the make and year of manufacture, type, WH-, engine- and chassis number (Fgst.Nr.), exact description of the spare part according to the spare part list and spare part list number. The spare part requests are run from the Werkstattkompanie through the Divisions-Ersatzteilstaffel to a ZEL and from there to the stock of the companies. That is why it is necessary to divide the request:*
>
> - *By manufacturer, for example instead of Kfz.15; Wanderer, Horch, Audi, DKW; m. gl. Einheits-Pkw with Horch engine, m. gl. Einheits-Pkw with Opel engine.*
> - *By part, which are produced by special firms, for example Bosch, Deckel, Deutz, Jurid, Ate, Knorr, ZF, Kugel-Fischer, Mahle etc.*
> - *By accessories, like cables, electric parts, equipment, material, tools etc.*
> - *By specialities. ...*
>
> *Spare parts supply under difficult circumstances:*
> *The collection of spare parts at the ZEL is done by the battalion, the regiment or the division. Pickup and supply detachments are used. It is advisable to have one or two liaison officers at the ZEL in charge.*
>
> *Normally Kfz. spare parts are only handed out in return for the old parts. This especially applies to larger parts and components, for example, engines, crank shafts, pistons, starters, generators, batteries, carburetors, spark plugs, etc.*
>
> *Under urgent circumstances, engines and transmissions can be received at the ZEL in exchange of a commitment note. This note must be signed by the Kompaniechef and include the following specifications:*
>
> - *The Kfz. is in a target-position ('Soll-Stelle').*
> - *The Kfz. needs to be fully operational again after the part is replaced.*
> - *The old part will be delivered after the spare part has been replaced.*
>   *(Detailed regulations are made by the AOK or the Division.)*

The supply points were different for the field and the replacement army. This is described in an order from In 6 (III Ing) No. 764 & 41 'Instruction for Maintenance of Pz.Kpfw. etc.' from 25 April 1941:

> *Spare parts for Pz.Kpfw. and low-bed trailers for Pz.Kpfw. are supplied upon request:*
>
> - *For the replacement army and field troops accommodated in the territory of the Befehlshaber des Ersatzheeres, by the H.Za. in Magdeburg-Königsborn.*
> - *For the field army, usually by the advanced Pz.Kpfw.-Ersatzteillager of the H.Za. Magdeburg.*
> - *Engines and transmissions which cannot be repaired by the troops are to be exchanged at the assigned Panzer-Ersatzteillager.*
> - *Useless but repairable road wheels, drive trains, idlers, bumpers, brake cylinders ... etc. which cannot be repaired by the troops are to be handed over to the respective Panzer-Ersatzteillager.*

This regulation was still valid by December 1942. According to Gen d Mot/Chef Inst (III) from 15 December 1942 Pz.Kpfw., Stu.Gesch. and Sfl. units in the field ordered their spare parts from the advanced Panzer-Ersatzteillager. All troops in the 'Heimatkriegsgebiet' ordered spare parts from the H.Za. Magdeburg. All troops from the occupied territory in the west from Pz. Nachschublager (F) Gien/Loire; spare parts for Lorraine-Schlepper through the branch Gen.d.Mot./Zentra Kraft West, Paris from foreign Zgkw. and track depot of ZEL 26, Paris. Spare parts for Pz.Sp.Wg. were requested at the advanced Panzer-Ersatzteillager. For all troops in the homeland, they were ordered at the Pz.Sp.Ersatzteillager in Frankfurt (Oder) [former it was Köln]. The Pz.Sp.Ersatzteillager in Frankfurt (Oder) also had spare parts for the superstructures of Schtz.Pz.Wg.

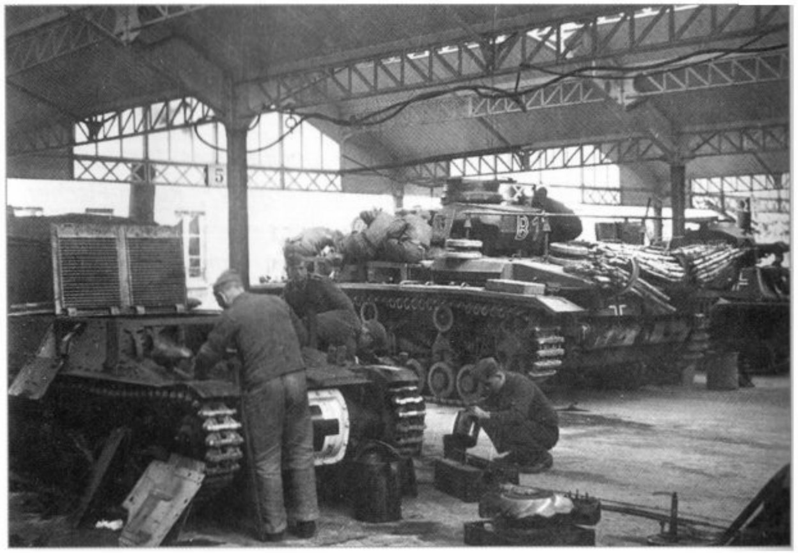
Order No. 38 in the motor technical appendix to the AHM from 11 May 1942 illustrates the workings of the spare parts system once more:

- *All Bosch spare parts for Zugkraftwagen must be supplied by the Wehrmachts-Ersatzteillager (WEL) für Bosch-Ersatzteile, Stuttgart-Wangen, Ulmer Str. 225.*
- *The Zentralersatzteillager and Heimatkraftfahrparke order their demands directly at this WEL.*
- *The field army sends its demands to the Zentralersatzteillager. The replacement army sends its demands to the respective Heimat- Heereskraftfahrparke. ...*

To give an idea of their locations, the following Zentrale Ersatzteillager (ZEL) existed in the H.Gr. or A.O.K. areas in early 1943 according to Luckner:

- Romanjemie (Finland)
- Pleskau (Estonia) [Maybe finally Riga]
- Borisow (Belarus)
- Berditschew (Ukraine)
- Dnjepropetrowsk (Ukraine)
- Pjatigorsk (North Caucasus) [planned?]
- Belgrad (Yugoslavia)
- Bengasie (Libya)
- Paris I (France)
- Namur (Belgium)

The Heimat-ZEL in the area of the Befehlshaber des Ersatzheeres were: Königsberg, Warschau I, Krakau, Stuttgart and Köln. They



▶ This is a facility of 'Baustab Oberst Becker' around Paris in 1942, where French vehicles were converted. On the right is a Lorraine-Schlepper 37 L (f), Ausf. VBCP as 'Krankenpanzerwagen' (armored ambulance), and a German Pz.Bef.Wg. Ausf.D1. *AMC*

were at the same time the reserve for the advanced front ZEL, so Königsberg served Pleskau and Köln served Paris I and Namur.
Then there existed Spezial-ZEL: Paris II, Berlin and Warschau II to supply spare parts for vehicles of French origin; St. Nazaire for Kfz. of English origin; Prag for vehicles of Czech make; Reichenberg (Sudetenland) for German Lkw of over 5t unladen weight. Additionally, up till the summer of 1944, the following Spezial-ZEL were formed: Breslau for reserves and surplus material; Weimar for machines, tools, accessories and consumables; Wien for 1,5t Steyr Lkw and Raupenschlepper-Ost (RSO); Dresden-Radebeul for Zugkraftwagen. Besides Breslau, these Spezial-ZEL served like the stock of a manufacturer. They contained the complete stock of the Wehrmacht, gave orders to the manufacturers, stocked the parts, and handed them out (Luckner).

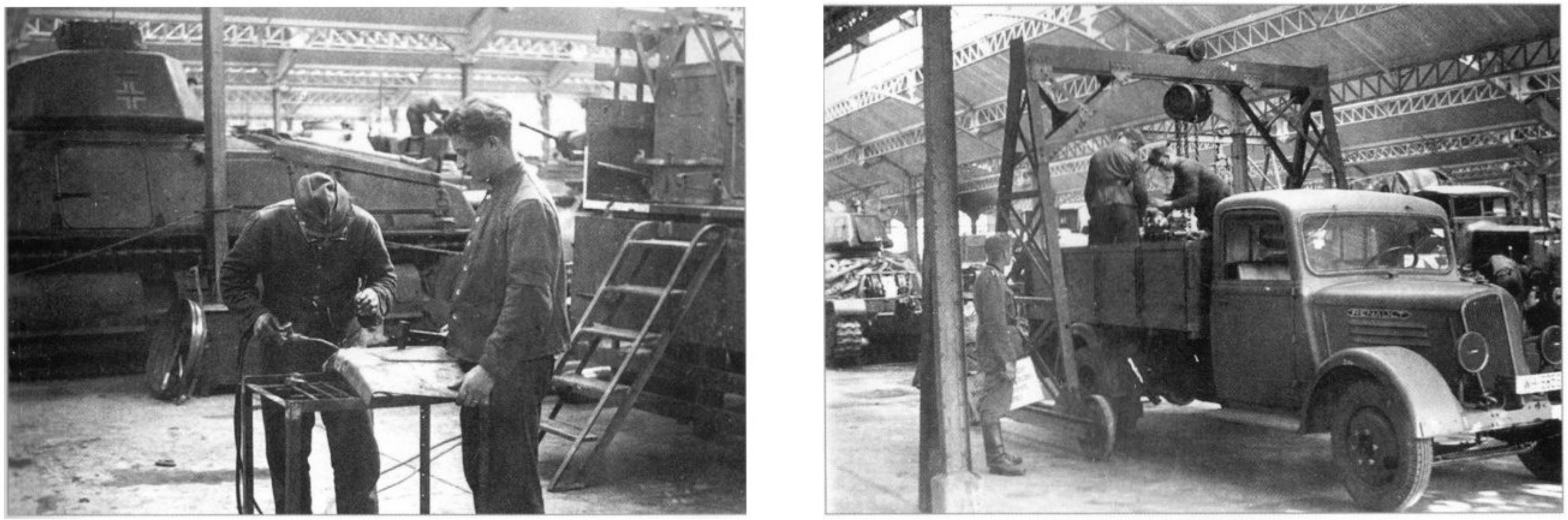
The 10th edition of the 'Frontnachweiser,' dated 15 December 1944, lists the following Zentral-Ersatzteil-Lager:
1, 1 (ital), 5 - 9, 12, 17, 19-24, 26, 29, 31, 36, 46, 104, 105, 109, 115, 120, 206, 212, 305, 307, 312, 404, 406.

Under letter D of the already mentioned order of In 6 from 8 April 1944 (see RtP1, p.41), in the chapter 'Capabilities of the I-Dienste' the following is said about the supply of Panzer spare parts:

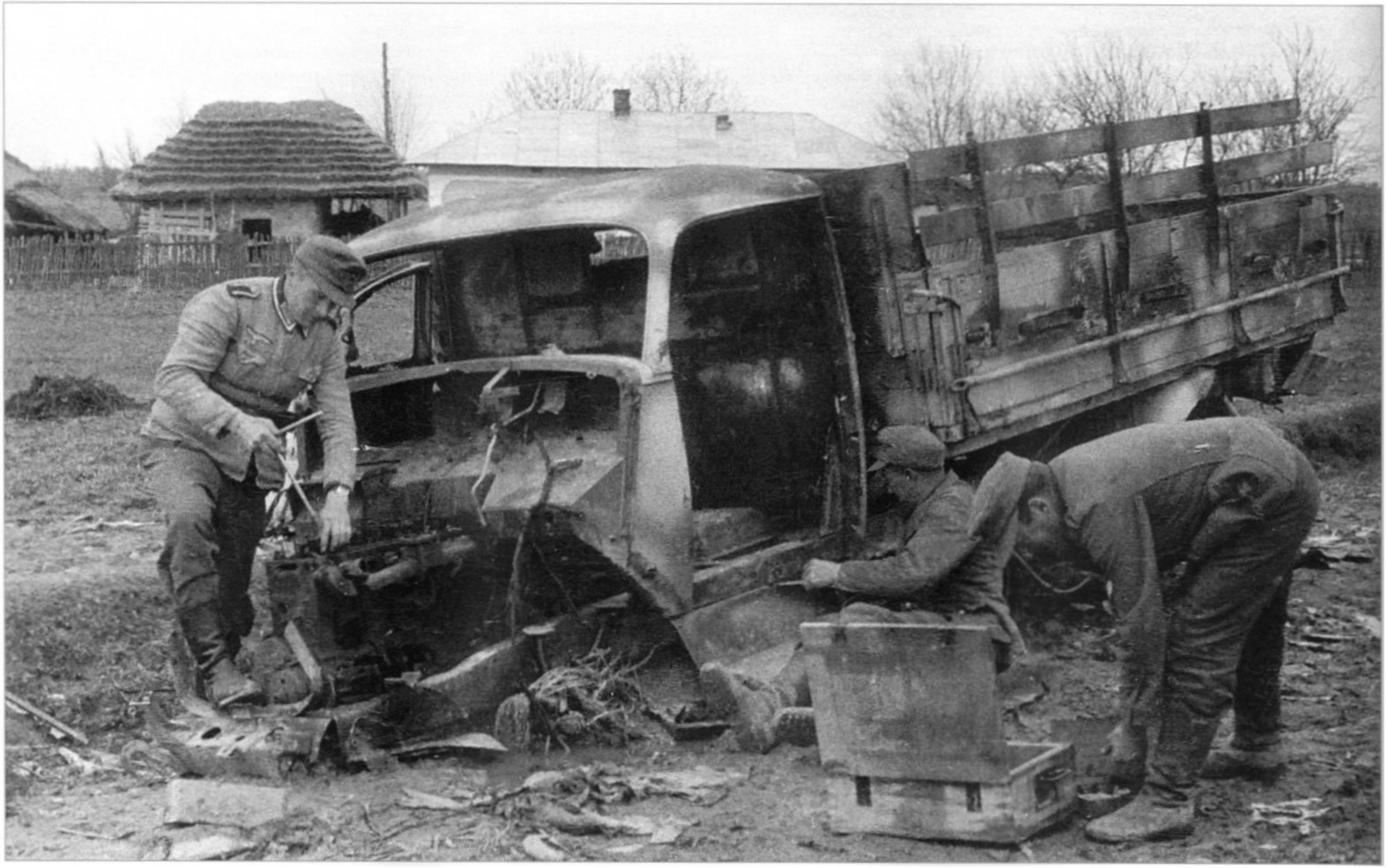
> *The supply of Panzer spare parts for German Pz.Kpfw., Stu.-Gesch., Pz.Jäg, Gesch.Wg. and Pz.Sp.Wg. is effected by the troops' requests.*
> *For field troops in the area of operation: from the advanced Panzer spare parts depots.*

For units in the homeland:

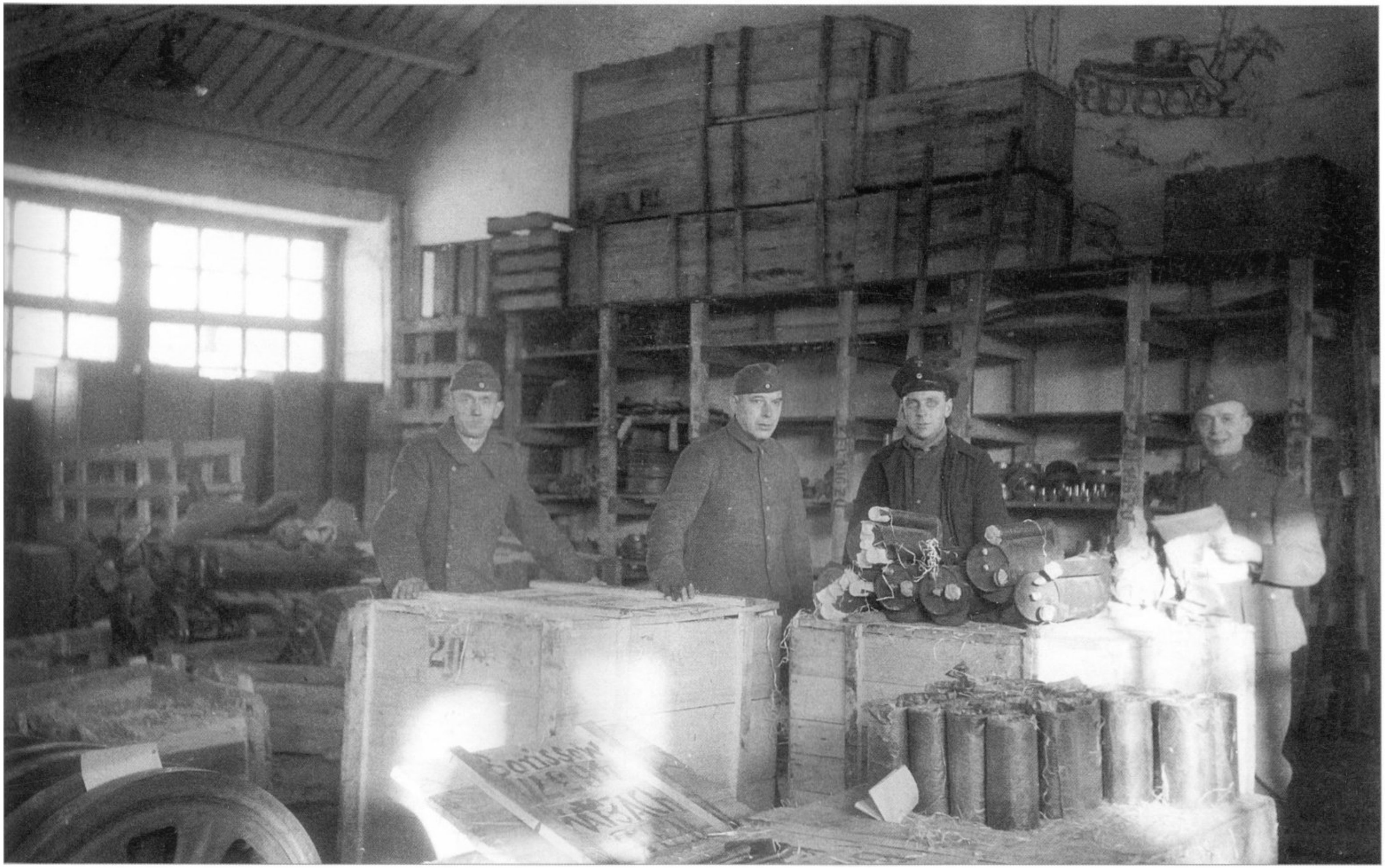
- *For Pz.Kpfw.I, III, IV, Tiger and variants, Stu.Gesch., Gesch. Wg. III/IV and Pz.Jäg.-Hornisse, as well as for all engines and transmissions for Pz.Kpfw., Pz.Jäg. and Gesch.Wg. (excluding Pz.Kpfw.38 and variants): from H.Pz.Za. Königsborn-Magdeburg.*
- *For Pz.Kpfw.II and variants, as well as Pz.Sp.Wg. II: from the Pz.N.Za. Oppelen (OS).*
- *For Pz.Kpfw. Panther and variants: from the H.Pz.N.Za. Breslau-Masselwitz.*
- *For Pz.Kpfw.38 and variants, including engines and transmissions: from Herres-Panzer-Nebenzeugamt Olmütz.*
- *For Pz.Sp.Wg. and variants: from H.Pz.N.Za. Frankfurt/O.*



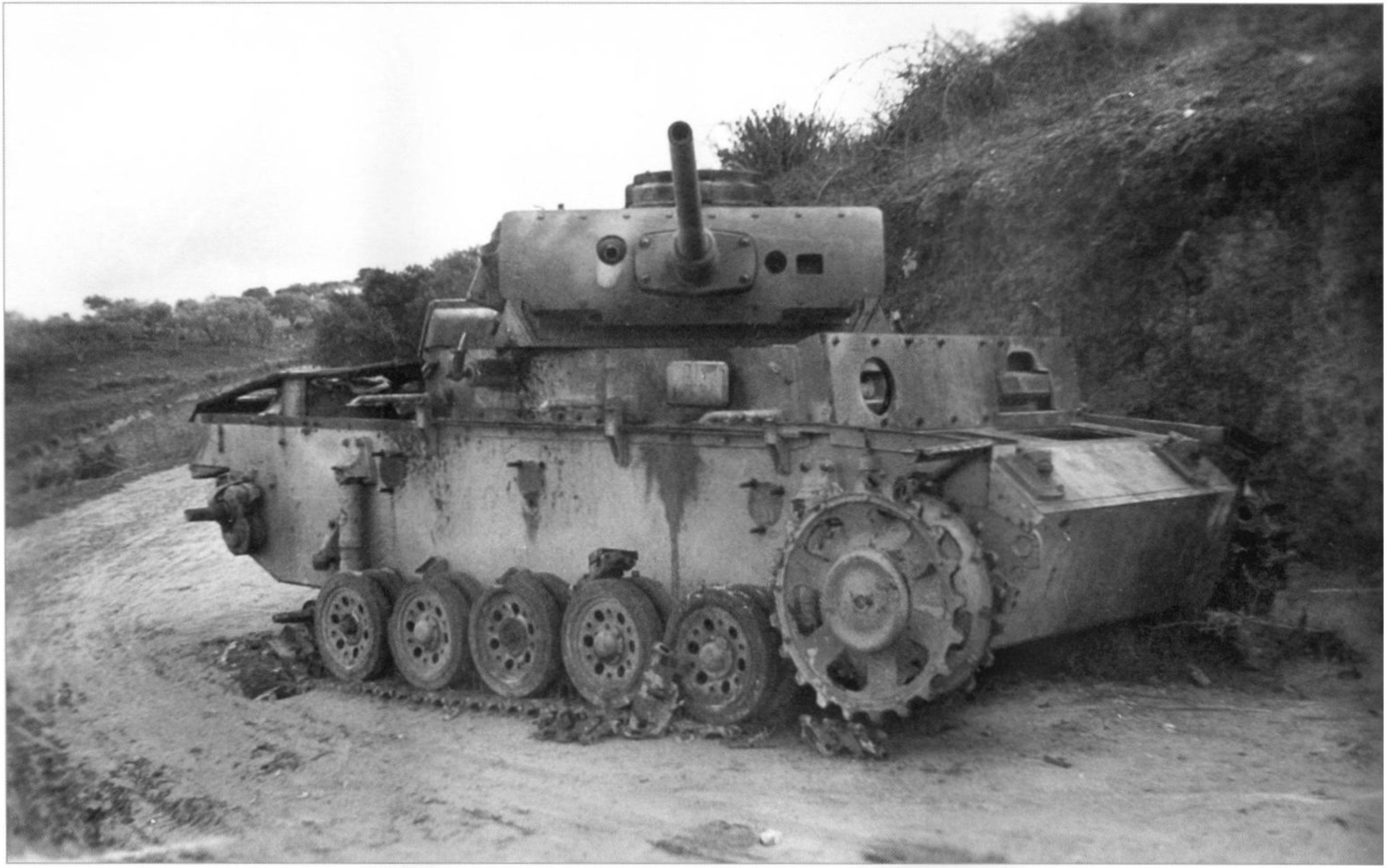
◀ On the left is a French Somua S-35 named Pz.Kpfw.35 S 739 (f) by the Germans. On the right is a French Renault AGC truck under a gantry crane on wheels. *AMC*



▲ Conditions the exact opposite of those depicted on the preceding pages in France at 'Baustab Oberst Becker'. A truck serving for spare parts. Often, various units fed from such a carcass and not much was left over for its previous owner. *AMC*



▲ One box is labeled 'Borissow.' The shelves in the background say ZEL 106 (?). Another photo from this series shows men standing in front of a sign saying 'H.K.P.562, Elektro-Werkstatt, Ankerwicklerei'. *AMC*



▲ This burnt-out Pz.Kpfw.III Ausf.G had been upgunned and fitted with the 'Vorpanzer' (extra armor) on its driver's front plate and turret front. A German cross is barely visible on the superstructure's side. *AMC*

Spares and Supplies in Action

5

1939: Into Poland 118

1940: Replenishment and into France 127

1941: The Balkans and Russia 135

1942: New Hopes, the Second Thrust 146

1943: Last Big Offensive in the East 151

1944: The Long Retreat 162

1945: Last Reports 182

The diary of the Abt. V, Pz.AOK 4, reproduced in RtP1, gave a comprehensive illustration of spare part supply in action. It showed that the German spare part distribution system worked. It also revealed that sometimes the troops or even the commands did not follow the chain of command and weakened the whole system as a result.

The diary also showed that at some points, spare parts were not available in sufficient numbers for certain vehicles. Nevertheless, it also confirmed that, for some urgent Panzer spare parts, such as transmissions and engines for Panthers and Tigers, extraordinary measures were taken to bring them to the front by air or 'Blitz-Pfeil' transport. In those cases, the production of the parts was not the problem, the availability at the front was. Parts took time to arrive at the (right) depot and then from there to reach the front line troops.

Also keep in mind that, as a matter of principle, during wartime there is a shortage of everything at all times, not only spare parts. Thus, new Panzers, accessories and spare parts were assigned depending on priority. Before continuing with the Abt. V, Pz.AOK. 4 diary, we gain insights into the spare parts and supply situation through other reports from various sources. The following reports start with the Polish Campaign in 1939 and last until the end of the war. They illustrate and confirm the 'theory' elaborated in Chapter Four with little or no difference.

1939: Into Poland

In the appendix of the KTB, the 1. General Staff Officer of XVI.A.K. listed the special regulation for supply from 17 August 1939 - 4 October 1939. The XVI.A.K. at that time had, among others, the 1. and 4.Panzerdivision under its command:

Special Regulation No. 2, [Probably 26 August 1939]

> *Spare parts for wheeled vehicles: The 'Kfz.-Sammelstellen' (Kfz. collection points) will only be elaborated on the 2nd Y day. In urgent cases, spare parts can be requested and picked up before that day at the collective depot of the Armee, Breslau, Daimler-Benz A.G., Strasser S.A.*
>
> *Panzer-spare parts: The request for Pz. spare parts must be presented to the 'Arbeitsstab Oppeln', Berfusschule, Moltkestr., Zimmer 27 (Oberbaurat Roller).*

Special Regulation No. 6, 30 August 1939

> *For spare parts and tire supply the divisions and troops of Gen. Kdo. XVI.A.K. are directed to the previous collection points:*
> *VIII/20 Oppeln*
> *VIII/26 Friedrichsthal*
> *VIII/4 Brieg*
>
> *The divisions shall establish a guarded evacuation point independent of the Wkst.Kp. and possibly close to railway stations or main roads. The troops directly subordinated to Gen.*

▶ A rather fresh looking duo. The Sd.Ah.116 was not liked by all troops unconditionally. However, as long as the ground stayed dry and the space was open, it worked fine. *TA*

Kdo. are directed to the Korps-Werkstattzug. It is ready from 30 August 1939, 12 o'clock in Rosenberg, Guttentagstrasse, Sawmill Knappe.

Special Regulation No. 8 , 1 September 1939

It is pointed out that requests for Kfz.-spare parts, accessories and tires must be addressed directly to the relevant Kfz. collection points.

In contrast, request for Pz. spare parts must be addressed to AOK 10 which authorizes distribution.

Tires are only handed out in exchange for the old ones.

Appendix No.2 contained an overview of local workshops in Poland including their brand such as Fiat, Hanomag, Auto-Union, etc. Also listed were the customer service agencies of Opel and General-Motors in Poland. This implies that the German units planned to rely on them as well.

Special Regulation No. 11, 7 September 1939

The AKP 541 has advanced on 6 September to Tschenstochau. It is ready to hand out spare parts, tires and replacement vehicles. The difficult spare parts situation makes it necessary for important parts to be removed from vehicles which cannot be repaired by the troops anymore and are thus sent to the Heimatpark.

Special Regulation No. 16, 18 September 1939

The AKP 541 in Tschenstochau has various spare parts ready that have been ordered by the troops and been brought forward from the homeland. These parts have not yet been picked up by the troops.

To avoid a longer accumulation of the spare parts at the Park but to still guarantee a correct forwarding, it is suggested that every division dispatches Abholkommandos, a maintenance sergeant or suitable man to the AKP that oversees the orders and transfer of spare parts for the division.

Special Regulation No. 18, 21 September 1939

For the 1. und 4.Pz.Div. the following replacement vehicles are ready to be picked up at the AKP 541 in Tschenstochau:

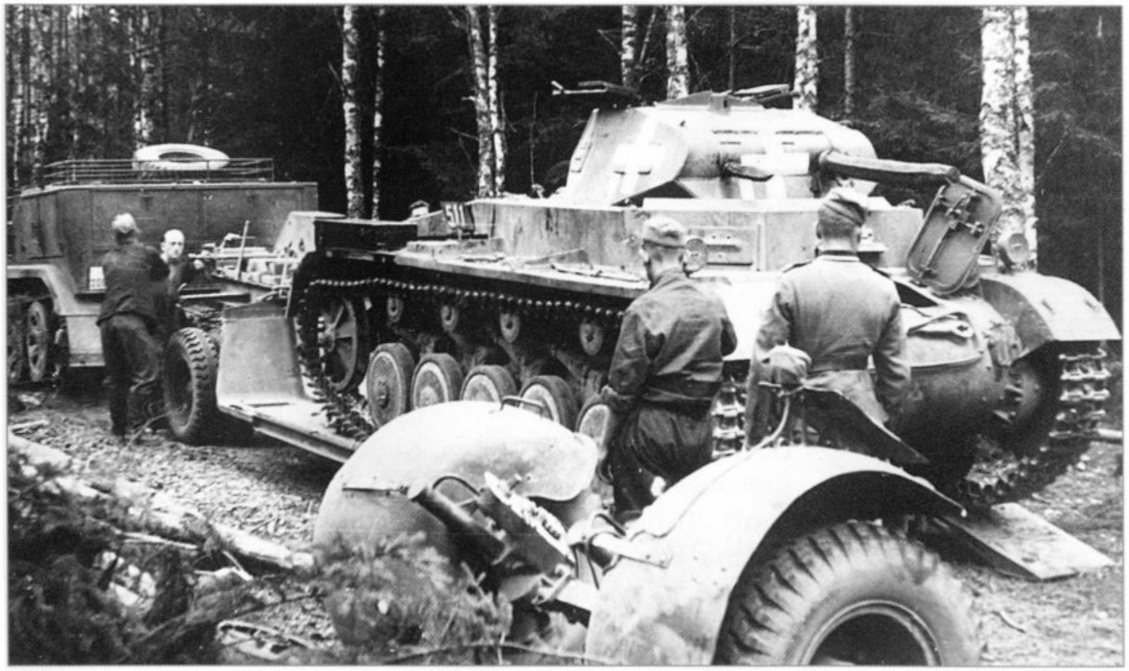
	Motorcycles	M/c sidecar	Pkw	l. & m. Lkw	s.Lkw	Zgkw.
1.Pz.Div	9	5	6	20	3	...
4.Pz.Div	9	4	6	20	2	1

AKP 571 in Kielce started repairing Kfz. Pz. spare parts and spare parts for Czech vehicles are available. Spare parts for wheeled vehicles and tires are so far only available at AKP 541.

Special Regulation No. 20, 24 September 1939

Non-military slogans, such as "Parole ist Heimat" or animal names etc., mascots, stuffed animals etc. are to be removed from vehicles immediately. ...

Broken-down Panzers are only to be repaired as far as that they



▼ A Pz.Kpfw.II Ausf. late A or early B in Poland is being loaded on the 8to version of the Sd. Ah.115, identifiable by the flat bed and the covered winch on the front cart. *AMC* *can drive under their own power again. No more spare parts are to be used for partial overhauls or to repair attrition.*

Repair work that exceeds mobilization must be done by the manufacturers in the homeland.

Special Regulation No. 21, 28 September 1939

Tires are no longer to be used until the pattern vanishes, but until the canvas shows underneath. Then immediately change the tires, so a remolding is possible.

Special Regulation No. 22, 29 September 1939

The AKP points out that is has not enough recovery vehicles to recover all broken-down Pz.Kpfw. On a limited scale the Heimtkraftfahrpark Oppeln has been pulled up for this task as well.

In the appendix of Gen. Qu./Qu 1 a list of losses ('Abgänge') of Kfz. of all kinds (excluding armored vehicles) is given:

Armee	Motorcycles	Pkw	Lkw	Zgkw.	Protze.Kw.	Trailers	Total
14	9	5	6	20	3	...	**795**
10	260	169	411	89	3	...	**962**
8	533	517	622	22	41	7	**1742**
4	95	51	65	13	...	1	**225**
3	269	140	139	18	1	1	**568**
7	23	10	...	...	...	...	**33**
5	90	39	132	1	...	4	**266**
1	47	...	105	1	...	...	**153**

On 27 September 1939 Gen. Qu./Qu 1 reported on the supply situation:

Fighting Vehicles:

Based on an order of Chef GenStdH from 10 September 1939 replacement vehicles from new production or homeland maintenance are not sent to the Ostheer anymore. The demand for spare parts is generally covered so that most armored vehicles can be made operational again.

Kfz. of all kinds:

The Kfz. situation is very tight. Replacement vehicles are only available in limited numbers. Further drafts from the economy are no longer possible. The troops can only be supplied with vehicles repaired in the Heimatkraftfahrparken. Army motor vehicles need to be taken from the current series production.

On 3 October 1939 the Quartiermeister of Gen.Kdo. XIX.A.K. wrote an experience report about the army supply during the Polish Campaign from 1 - 24 September 1939. The XIX.A.K. was part of the 4.Armee and had command over the 2.Infanteriedivision (mot), the 20.Infanteriedivision (mot) and the 3.Panzerdivision. The report distinguishes between the first operation in the corridor and the second operation in East Prussia.

The tactically preordained, unrelenting advance of the troops naturally resulted in a daily increase in the difficulties of supply, because of the rapidly increasing distance to the supply bases. These bases could not be forwarded over the Polish border because of the destroyed railroad, which needed to be bridged by the Korps or the divisions. The distance of supply routes eventually was over 350km long.

Weapons and Equipment:

Due to traffic accidents, weapons and equipment were already lost in the assembly area. Replacements could not be effected because the Armeeparke were not installed yet and the local administration in charge had no instructions for distribution. Due to the new subordination under another Armee, no replacements of weapons or equipment occurred either then or during combat.

Tires:

The troops started the campaign with insufficient stock of tires, because requests for tires at the Zeugämter have only been *fulfilled in very small numbers since early 1939 and because in June new vehicles arrived but without tires. So it happened that the request for tires were already exorbitant after the first days, so that the tire depots could not nearly fulfill the request - only approximately 15% were fulfilled.*

Vehicle Replacements:

Almost nothing was prepared for the first losses of vehicles, especially motorcycles with sidecars, combat vehicles of all kinds and Lkw. So it happened that:

- *Not a single combat vehicle was replaced,*
- *The lack of heavy motorcycles with sidecars was more and more noticeable,*
- *Not a single one of the 150 requested LKW had arrived.*

The consequences were that the troops, in order not to lose transport capacity, towed many unroadworthy Lkw, thereby damaging the towing Lkw, which led to new losses.

For a new deployment, it is demanded that all broken-down vehicles are replaced before the operation and that the Heimatkraftfahrparke have sufficient replacement vehicles available to help the troops quickly.

Kfz. Maintenance:

The I-Dienst der Truppe as well as the Panzer- and Divisions-Werkstattkompanien have completely proved themselves.
It is thanks to their relentless work that the complete Kfz. equipment held up relatively well against the exceptional challenges.

The Kfz. losses during the first operation were relatively low and within acceptable limits. This is mostly thanks to the fact that the I-Dienste and Wkst.Kp. still had their original stock of spare parts. During the second operation however, the losses climbed to a critical number. This was the result of long marching distances and the almost completely used up spare parts stock of the I-Dienste and Wkst.Kp. Another reason was that a regulated, really effective spare part supply was practically nonexistent.

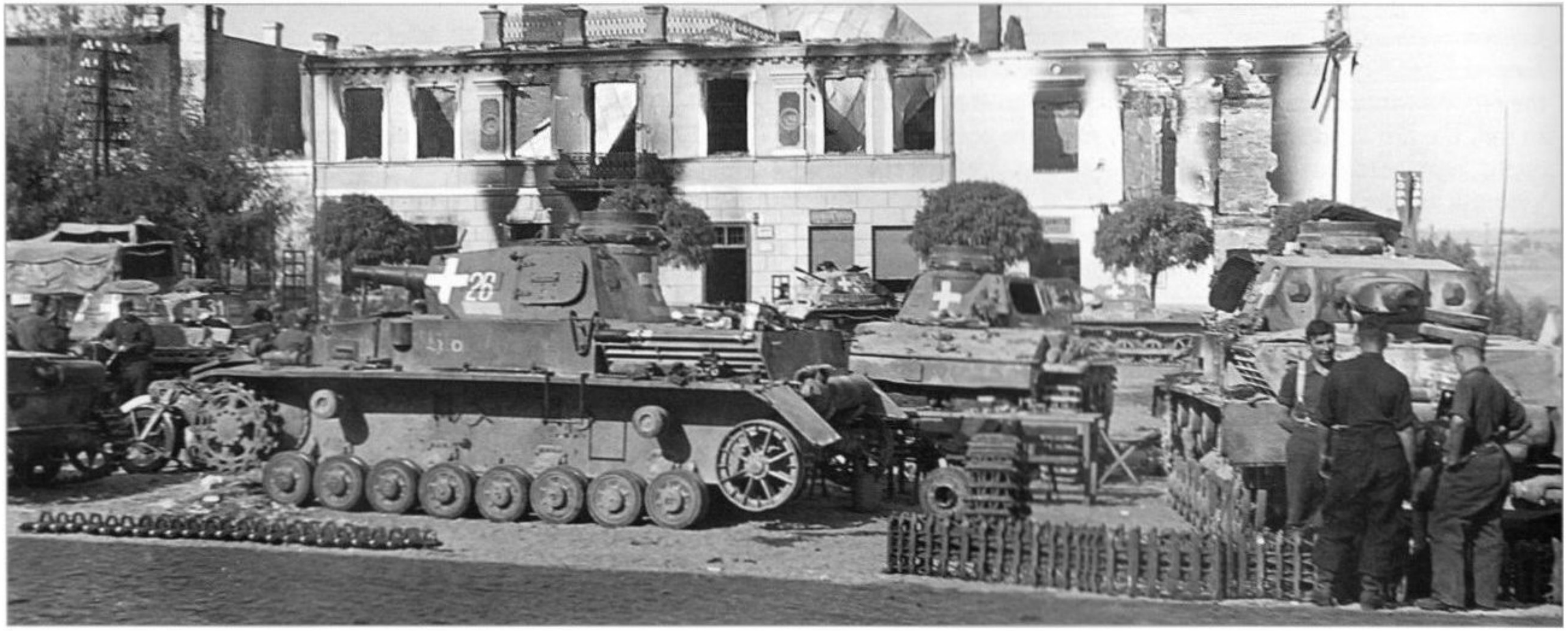
The Korps was assigned to the depots in Stettin and Gr.Born (Pz.E-Lager), then to AKP 501 in Allenstein and finally to AKP 581 in Arys. But it turned out that these depots and parks did not nearly have enough of the necessary stock, especially the regularly requested parts.

The necessary, constant refill of those depots with the most common parts did not happen and apparently was not planned for either. This resulted in the troops and Wkst.Kp. driving hundreds of kilometers to the homeland trying to obtain the most necessary spare parts on the market. Although this method of supply required a disproportionately high expenditure of fuel, vehicle wear and a long, highly unfavorable absence of officers (Ing.), administrators, 'Werkmeistern', maintenance sergeant, etc., only a tiny bit of the required spare parts could be obtained this way.

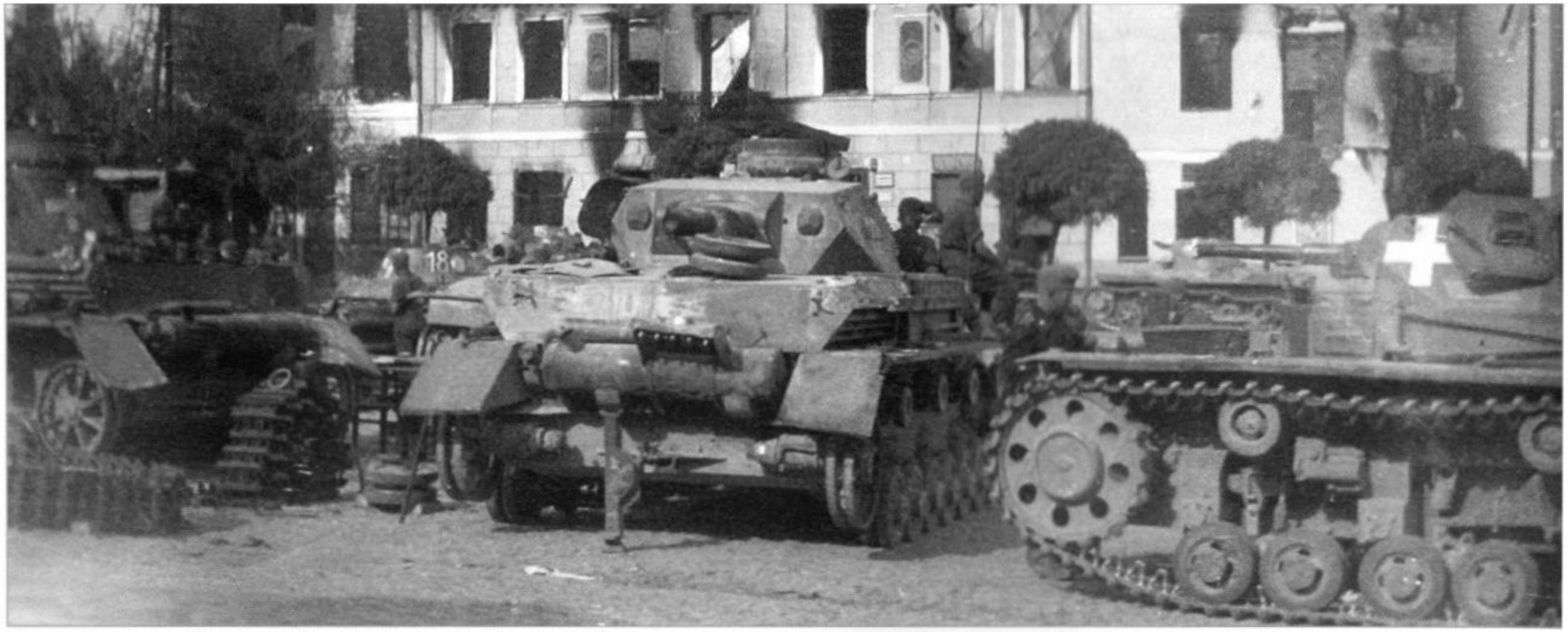
The failure of spare part supply led to a severe lack of spare parts during the second operation so that the I-Dienste and Wkst.Kp. generally had to fall back on patchwork with insufficient means. The complete failure was especially noticeable with all tracked vehicles, meaning Pz.Kpfw. and Zgkw. The very high number of break-downs of Pz.Kpfw. and Zgkw. during the second operation could have been avoided if a structured supply system, especially of spare parts for the suspension and of rubber pads, had been put in place.

Since the capture of Brest-Litowsk, the request of rubber pads amounted to 35,000 while since the beginning of the campaign the Gen.Kdo. XIX.AK received only about 5,000 pads. All requests of the Korps at AOK 3 and AOK 4 and the bureaus of the OKH were in vain.

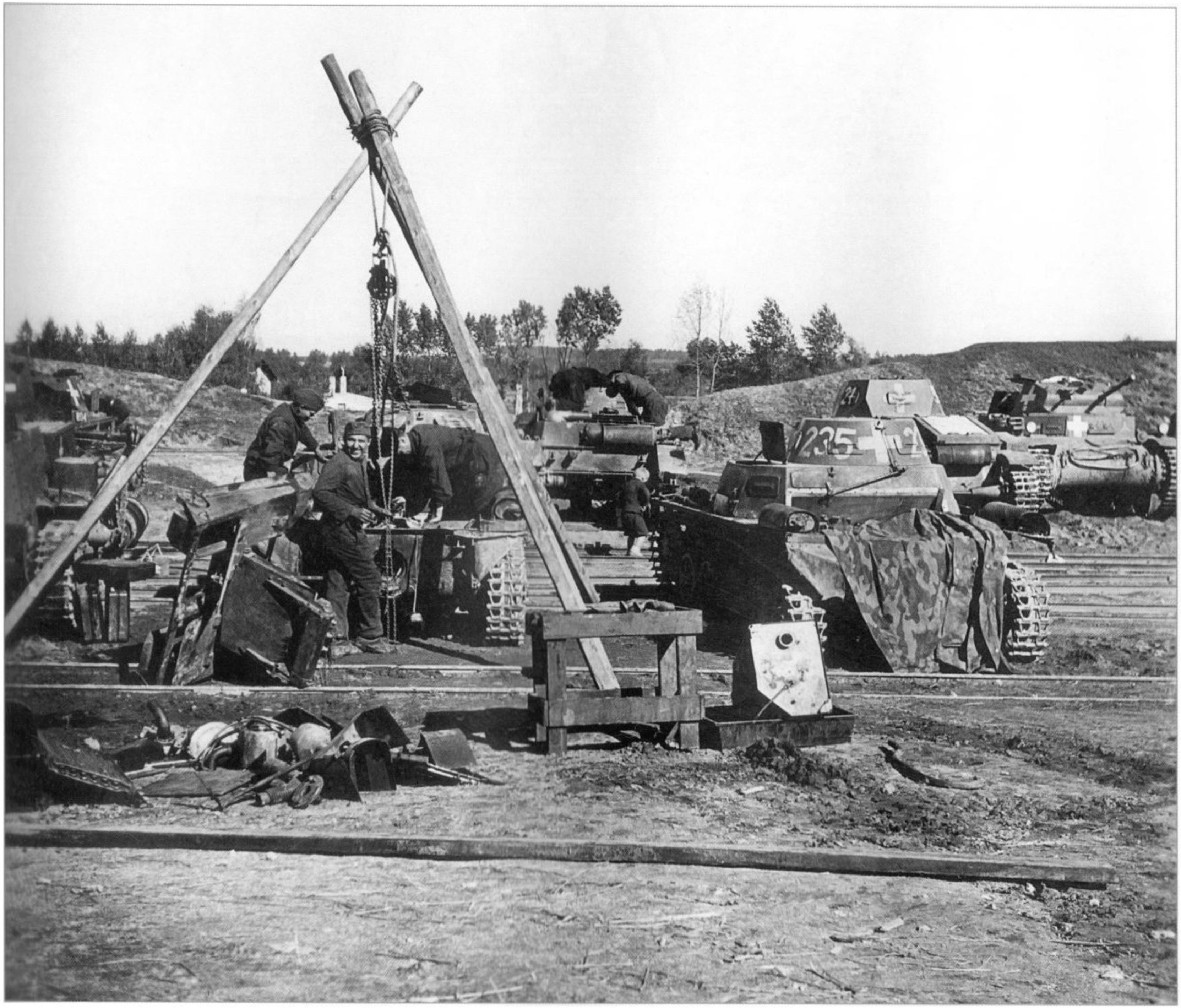
Based on its experience, the Korps has the impression that the supply of spare parts, mainly for non-commercial vehicles and especially for rubber pads, is not secured, although their importance has been pointed out clearly in numerous experience reports from the operations in Austria and Sudetenland as well as Bohemia and Moravia.



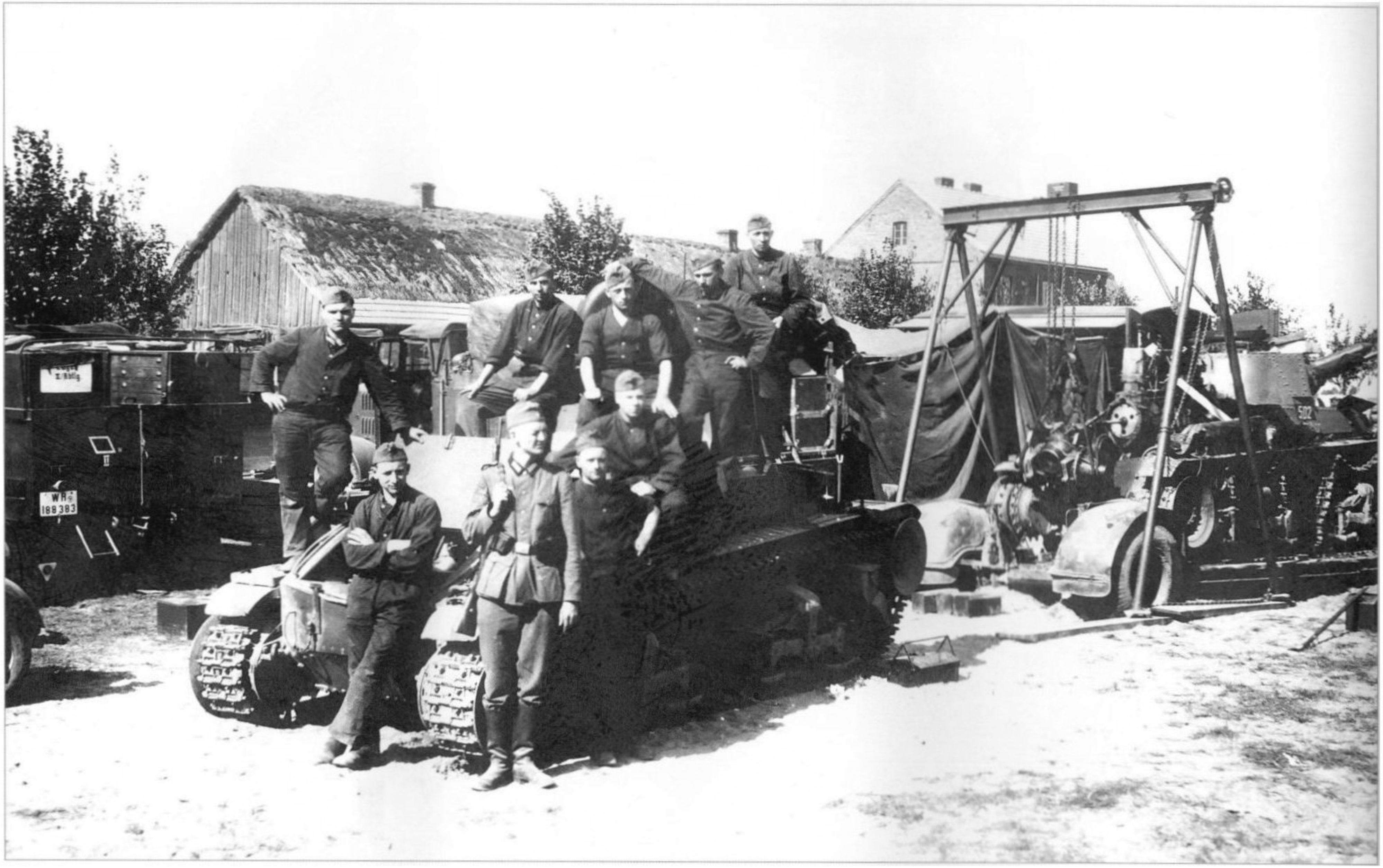
▶ A Pz.Kpfw.IV Ausf.C of Pz. Rgt.15 in Opatów, Poland. Also visible are several Pz.Kpfw.I, II, III and IV. A sign with the name 'LOPP' is visible in the background to the right of the building. *AMC*



▶ The Pz.Kpfw.IV now in the center of the photo is an Ausf. B. The tank on the right is a Pz. Kpfw.III Ausf.C with a 3,7cm KwK. *AMC*

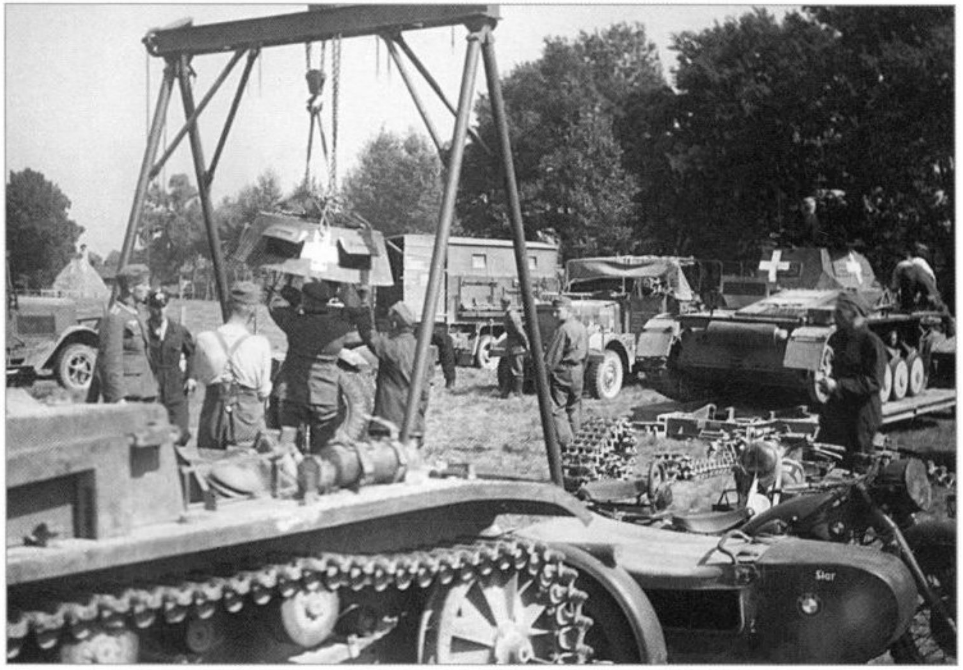


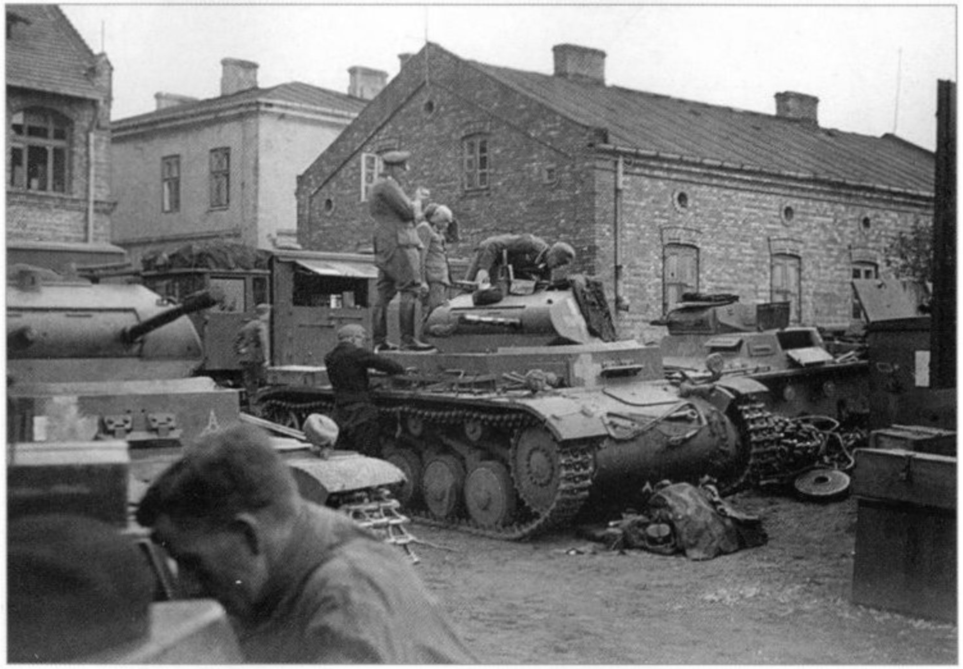
◀ Two Pz.Kpfw.I Ausf.A and some Pz.Kpfw.II from the 4.Pz. Div. at the Wkst.Kp. during the Poland Campaign. On the far left is a Czech tank and Pz.Kpfw.II 'R04'. *AMC*



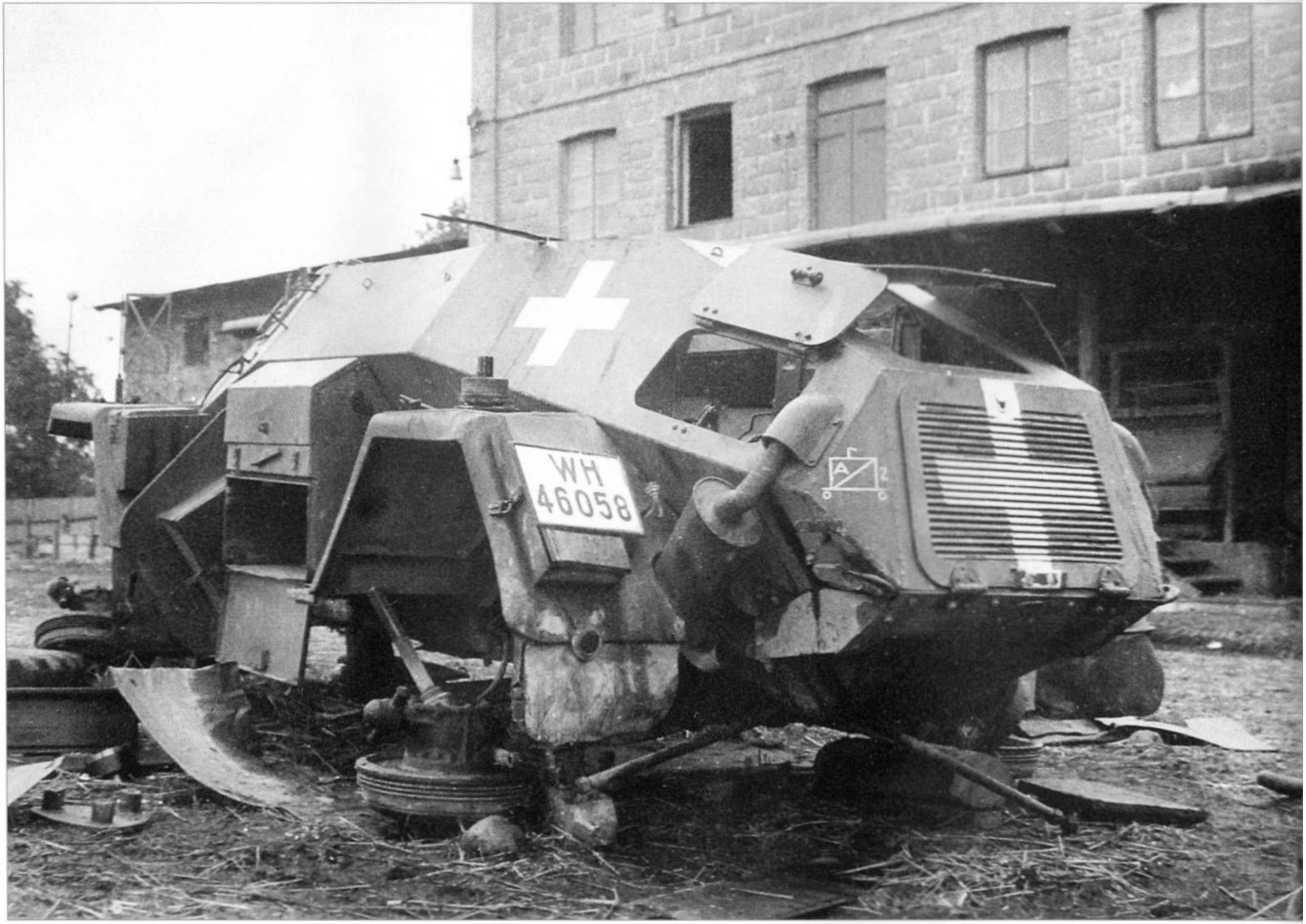
▲ Two L.T.M.35, Pz.Kpfw. 35(t) in a Wkst. On the left is a truck 'Lager 2. Abtlg' (depot second battalion). This could mean that the vehicles belong to Panzer-Regiment 11, the only unit equipped with these tanks that had two Abteilungen. *WA*

▶ Landsers pose for a photo with the transmission of the Pz.Kpfw. 35(t) on the Sd.Ah.115. *WA*





Top Right: A Pz.II with the call sign '802' is on a Sd.Ah.115, a Kfz.79 Wkst. truck is in the background and a BMW motorcycle is in the foreground. Bottom right: More vehicles from the 4.Pz.Div. The Pz.II in the center has an MG mount as can be seen on p.196 of RtP1. *WA, HE*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Experiences made during the Polish Campaign revealed that motorized units only have a chance to face longer fighting periods successfully if spare parts supply is guaranteed and can adapt quickly to the fast movements of the motorized units.

Recovery means for heavy Panzers [at this time heavy Panzers were Pz.Kpfw.III and IV] are missing and need to be obtained.

The 1.leichte Division wrote a status and experience report on the Polish Campaign dated 4 October 1939:

The condition of all vehicles requires a long stay in the home garrison because rapid and adequate vehicle repair is only possible in the garrison workshop and at the production firms. More than four weeks are needed to repair the Panzers if the repair parts arrive. All of the Panzerkampfwagen and 50% of the artillery Zugmaschinen need new tracks. By the time the Panzers reach the train loading station, they will have reached the limit of 3,000km. The tracks are already beginning to break. Due to these worn out tracks, Panzer-Regiment 11 (including Pz.Abt.65) will be immobilized after being transported by rail to the home garrisons. Without considering the track situation, 80% of the Pz.Kpfw.II, 44% of the Pz.Kpfw.III (Skoda) [Pz.Kpfw.35(t)]and 75% of the Pz.Kpfw.IV are operational.

The big surprise during the first days in combat was that a hit from an anti-tank gun did not automatically result in killing the Panzer crew. Out of five hits, usually one penetrated the armor. When a Panzer was penetrated, usually only one of the crew was killed. Drivers and radio operators were in the greatest danger. This revelation significantly raised the crew's fighting spirits.

◀ This wrecked leichter Panzerspähwagen (M.G.) (Sd.Kfz.221) belonged to the 2nd squadron of a reconnaissance Abteilung. Welding work by the troops on the thin armor of this vehicle was prohibited. *AMC*

1940: Replenishment and into France

General Halder noted on 23 January 1940:

General Wagner, Gen.Quartiermeister Genst.d.H.:

- *Motor vehicle situation catastrophic - tracks - rubber pads.*
- *Monthly production of tracks: 3,000. Shortage: 22,000.*

On 4 February 1940 Halder noted:

General von Schell, GBK: We have 120,000 Lkw. For the army we cannot expect more than 1,000 Lkw per month. This is less than 1% and no reserve. If we reckon a monthly attrition (without combat) of 2%, which corresponds with the experience, then the new production only covers the consummation by half. Result: Constant decrease. We cannot conduct operations like this.

...

Conclusion: After a certain length of operation (the duration depends on the road conditions, supply and combat losses) we will be forced to interrupt the operation because a full replacement of the losses cannot be expected. Such a break after the Polish Campaign took four weeks. It has transpired that it was not enough.

As seen in Chapter One of RtP1, the Armee-Kraftfahrparke were now pushed forward to keep contact with the front troops. Qu.Abt. XV.A.K., which had among others, the 5. and 7.Panzerdivision subordinated, noted this forward deployment in an appendix to their KTB:

31 May 1940:

Panzer spare parts must be obtained at the Panzer spare part depot in Mons; Panzer-Spähwagen spare parts must be obtained in Maisaires; Wheeled vehicle spare parts must be obtained at the AKP.

4 June 1940:

AKP 561 is moved to St. Pol starting 5 June. Readiness for work:

7 June 40.

6 June 1940:

> *Special orders for supply No. 14:*
> *AOK 4 reminds that the cannibalization of Kfz, dismounting wheels etc., also from damaged and captured vehicles, is strictly forbidden.*

16 June 1940:

> *AKP 561 is deployed in Rouen. It is ready to start work on 17 June.*

June 22 1940:

> *AKP 561 is deployed in Mortagne. It is ready to work since 21 June.*

Despite the relatively good infrastructure in France and the Low Countries, transport problems on the road and railway hampered the supply and the evacuation of damaged Panzers. The Gen.Qu. was quoted on 8 June 1940 in Halder:

> *The troop movements are congesting all roads and the railroad is working irregularly.*

The Gen. Qu./Qu 1 stated on 2 June 1940 that:

> *Due to missing rail connections, evacuation of broken-down Pz.Kpfw. to factories in the homeland is not possible for the time being.*

At that date, the stock of Panzerkampfwagen and Panzerspähwagen were distributed to the Panzer-Divisions in relation to their losses. The Gen. Qu./Qu 1 warned:

> *For covering future losses, only vehicles from the current series production will be available. Thanks to the replenishments the Panzer-Divisions regained approximately 80% of their strength as of 10 May 1940. Besides the Sd.Kfz., the considerable losses of motorcycles will be hard to cover. Zgkw. cannot be replaced for the time being.*

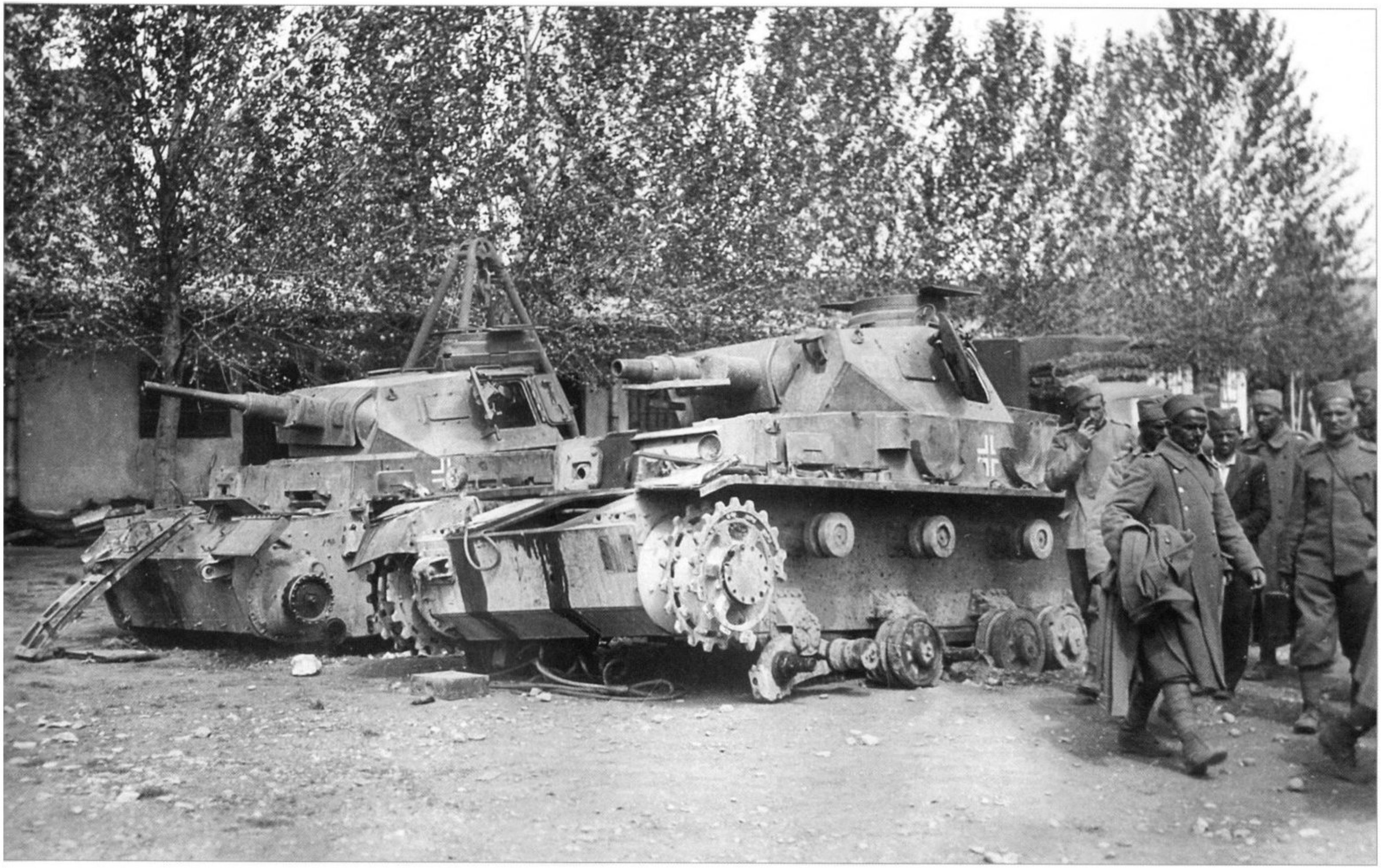
On 12 June 1940 the Gen. Qu./Qu 1 reported again:

> *Only vehicles from series production and a few repaired Pz.Kpfw. from the factories in the homeland are available as replacements for lost armored vehicles. Because at this moment Panzers from Belgium and France cannot be evacuated due to the railroad situation, the supply of repaired Panzers can only be small.*
> *The supply situation of the other motor vehicles is guaranteed. The troops can help themselves to captured vehicles.*
> *A shortage exists of motorcycles, Zgkw. and Sd.Kfz.*

Replacement Panzers were available, but due to the end of the campaign and the insecure transport situation, were only handed out reluctantly. Gen. Qu./Qu 1 reported on 22 June 1940:

> *As replacements for armored vehicle losses the H.Za. Magdeburg currently has available from new production and maintenance: 10 Pz.Kpfw.I, 25 Pz.Kpfw.III, 12 Pz.Kpfw.IV, 11 Pz.Kpfw.35(t) and 16 Pz.Kpfw.38(t). Delivery to the troops is only intended within the context of replenishment. Because of the insufficient transport situation, on time delivery cannot be guaranteed, and on long marches break-downs must be expected. Reserves of other motor vehicles are currently nonexistent. The previous supply of Kfz. spare parts is only enough to cover the current requests of the troops. The pending request from the AOK for rubber pads and tracks can only be partly covered. After the battle an additional, larger, need is to be expected. Thus the production must be further increased.*

The write-offs of tracked and wheeled vehicles that could not be repaired within five days as of 31 July 1940 were given by the Gen. Qu. and are shown on page 130.



▲ Pz.Kpfw.III Ausf.H and a Pz.Kpfw.IV Ausf.D in France are being cannibalized. According to Craig Ellis, the style of turret number is an indicator of the 9.Pz.Div. Also the bracket welded to the superstructure side is correct for this unit. *AMC*

Type	Losses since 10/05/40	Replacements	Shortfall
Pz.Kpfw.I	141	48	213
Pz.Kpfw.II	196	...	636
Pz.Kpfw.III	109	71	103
Pz.Kpfw.IV	83	19	129
Pz.Bef.Wg.	56	8	70
LTM 35	44	35	23
LTM 38	54	74	+5*

** In the context of replenishment so far, 38 Panzer-Wagen 38(t) were assigned in July.*

Previous to 31 May 1940, the following replacements were sent to the units: 48 Pz.Kpfw.I, 71 Pz.Kpfw.III, 19 Pz.Kpfw.IV, 8 Pz.Bef. Wg., 35 LTM 35 and 36 LTM 38. In June and July no replacements of Panzers were sent.

Type	Losses since 10/05/40	Replacements	Shortfall 31/07/40
Motorcycles	8515	4323	4126
Pkw	3777	3923	1276
Lkw	6450	4268	2779
Zgkw.	273	47	187
Rad u. Kett Schl	77	45	178
Trailers	176	97	274
Sd.Kfz.	105	77	33
Krkw.	137	141	51
Total	**19615**	**13019**	**8995**

The deficiencies are due to troops turning in their vehicles to the Heeres-Kraftfahrparke and Kfz. collection points for repair. Because of the heavy wear from the campaign and the very bad conditions of the Beute-Kfz., only a portion of them can be expected to return to the troops as fully operational.

In September 1940, the Gruppe Guderian (XIX.A.K.) also wrote an experience report about the army supply, signed by General Nehring for the Gruppe command. It declared that the 'old' supply system is not suitable to modern, highly mobile warfare but also comes to the conclusion that improvements have been made after the Polish Campaign.

> ...
>
> *Because all supply units of a Panzer-Gruppe are only deployed in a mobile manner, the assignment of an AKP in its prior configuration is unsuitable.*
>
> *The assignment of recovery units and workshop companies and especially mobile supply columns to the divisions will be more useful for such fast paced operations.*
>
> *Since, in reality, the workshop companies of the divisions are commanded by the engineer in charge, it is more convenient to release them from the command of the supply leader and concentrate them under the collective term 'Instandsetzungsdienste'. ...*

Equipment

> *Replacement of equipment could take place only when the troops were resting. But, because the subordination to an army changed during a rest, the requests placed during the operation lapsed and needed to be placed again. The new army, however, was incapable of fulfilling the orders, because they were not supplied with the requested equipment, especially not for Panzers. ...*

Instandsetzungsdienste

> *During the advance in the West, the emphasis of maintenance was on the I-Gruppen and I-Staffeln of the troops. To a high degree it is due to their tireless efforts and their desire to help the troops advance by all possible means that, despite the current maintenance organization and the problems resulting therefrom, and despite the insufficient spare part supply, the number of losses of wheeled vehicles was kept relatively low, and the troops remained mobile for so long.*

Workshop Units

> *The Wkst.Kp. of the divisions and the Pz.Wkst.Kp. of the Panzerregiments were always heavily overloaded by larger*

that could not be handled by the I-Dienste of the troops. The work performance of the workshop units decreased:

a. Due to the loss of time resulting from the numerous necessary movements and
b. Because the workshop units were still missing efficient and fully trained specialists.

This applies to the enlistees as well as the 'Werkmeister'. In addition, various workshop companies are not yet led by officers (Ing.) but by reserve officers without technical backgrounds. Numerous workshop units thus work with a very low degree of efficiency. A systematic and standardized education of all specialists from workshop companies could increase their performance by a multiple.

In some Panzer-Divisions and one Infantry-Division (mot) the workshop companies were not under the command of the division's supply leader but directly under the division's engineer. This command relationship proved itself under all aspects. It clears some existing obscurities concerning the responsibility about the deployment of the workshop units in advance. Additionally, it guarantees a distinct and clear consolidation of all maintenance aspects under the division's Ing.

Because of the fast advance, the Pz.Wkst.Kp. had to be left far behind to be able to perform their work and were then not available to the troops at the front. This could have been avoided if Kfz.- and Panzer- WKst.Kp. under the direct command of the Gen.Qu. could have been deployed on request of the Korps in areas with a great number of damaged vehicles more rapidly.

Recovery Units

The poor outfitting of Pz.- and Inf.Div. (mot) with recovery units has meant that our own valuable vehicles as well as captured vehicles could not be secured fast enough and thus were partly lost. It is necessary to equip the Divisions' workshop companies with an 'Abschleppstaffel' (towing section).

The 10t low-bed trailer proved valuable while the 20t low-bed trailer has to be construed as unusable in the field. An elaborated report about its shortcomings has already been sent to the OKH from Gen.Kdo. XIX.Armeekorps before the beginning of the campaign in April 1940.

The assignment of Abschleppzug 419 to Gen.Kdo. XIX.Armeekoprs proved very valuable. Its equipment is still inadequate. The s. Lkw (Faun) is not suitable as a towing vehicle for the 10t low-bed trailer. It lacks sufficient cross-country ability and is missing a winch, which is indispensable during towing and recovery service. Based on experiences, only the Zgkw.8t and Zgkw.18t can be used as towing vehicles.

Spare Parts Supply:

a. For wheeled vehicles:

Thanks to the formation of a supply section for spare parts in the winter 1939/1940, a small improvement in spare parts supply was noticeable over the Polish Campaign, but it is not yet enough by far. During the first operation, the present supply sections of Gen.Kdo. XIX.A.K. within Gruppe von Kleist were not nearly enough. The stocks of these supply sections were quickly exhausted, the replenishment of the stocks then took too long, so that, during the second operation, only very few spare parts could be gathered from the Ersatzteilstaffeln.

b. For Zgkw. and M.T.W.:

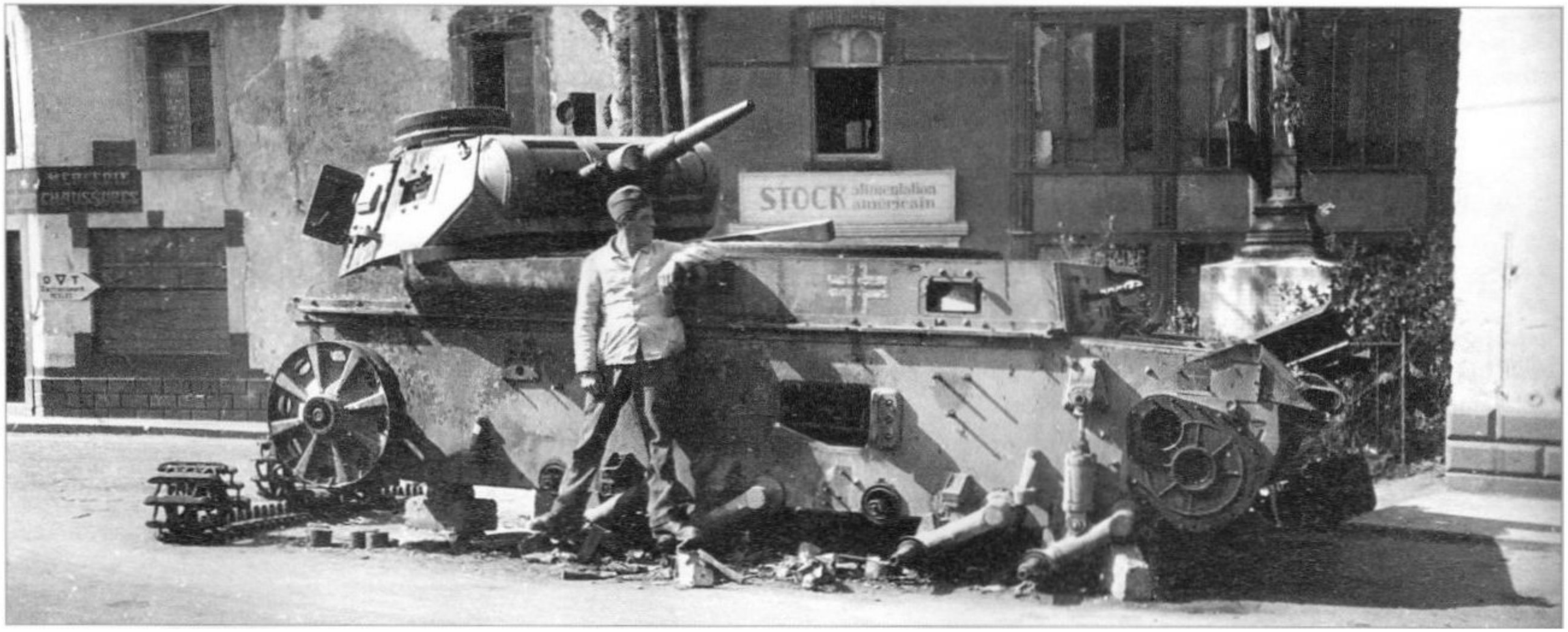
The spare parts supply for Zgkw. and M.T.W. was insufficient as well. This is especially true for the rubber pads of the tracks. Numerous Zgkw. and even more M.T.W. had to run on their blank tracks during the second operation. This led to, besides numerous losses of these vehicles, extensive track and suspension damage.

c. For Panzerkampfwagen

The spare parts supply for Panzerkampfwagen, especially Pz. Kpfw.III and IV, were insufficient as well. To keep the combat strength of the Panzerregiments passably high, the Pz.Kpfw. often had to run with heavily worn rubber rims, sometimes even without, which is a destructive expenditure of valuable, hard to replace material.

It paid to bundle all supply and have it coming from the Panzer spare part depot in Mons during the pause between the first and the second operation, even if it meant that the Panzerregiment

The two white bars on the back of the turret indicate this vehicle belonging to Pz.Rgt.1. The white sign behind reads: 'STOCK, American Alimentation'. The colorful sign at the corner indicates a shoe store and the marker below points to a cement plant. The white building in front of the Panzer was the 'Café des Hecquet'. *LA, HE, AMC*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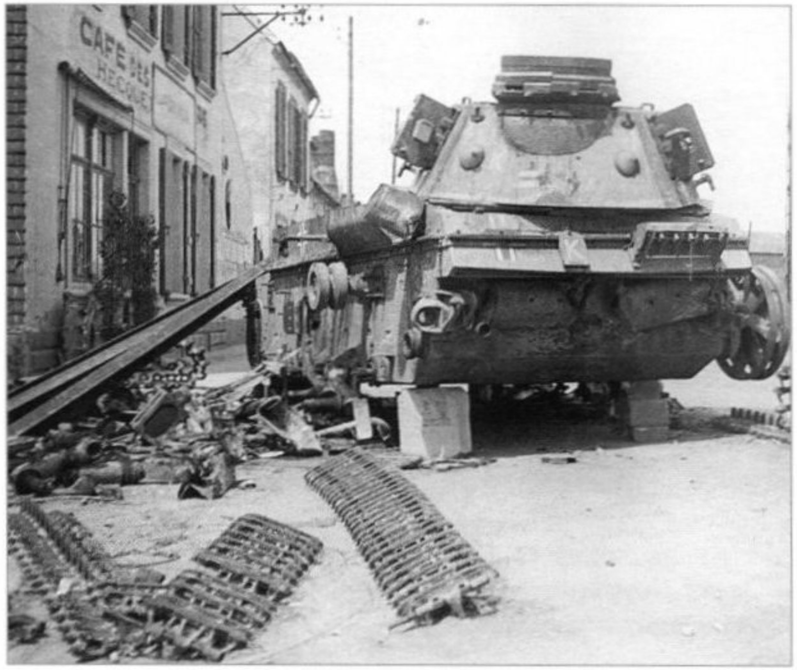
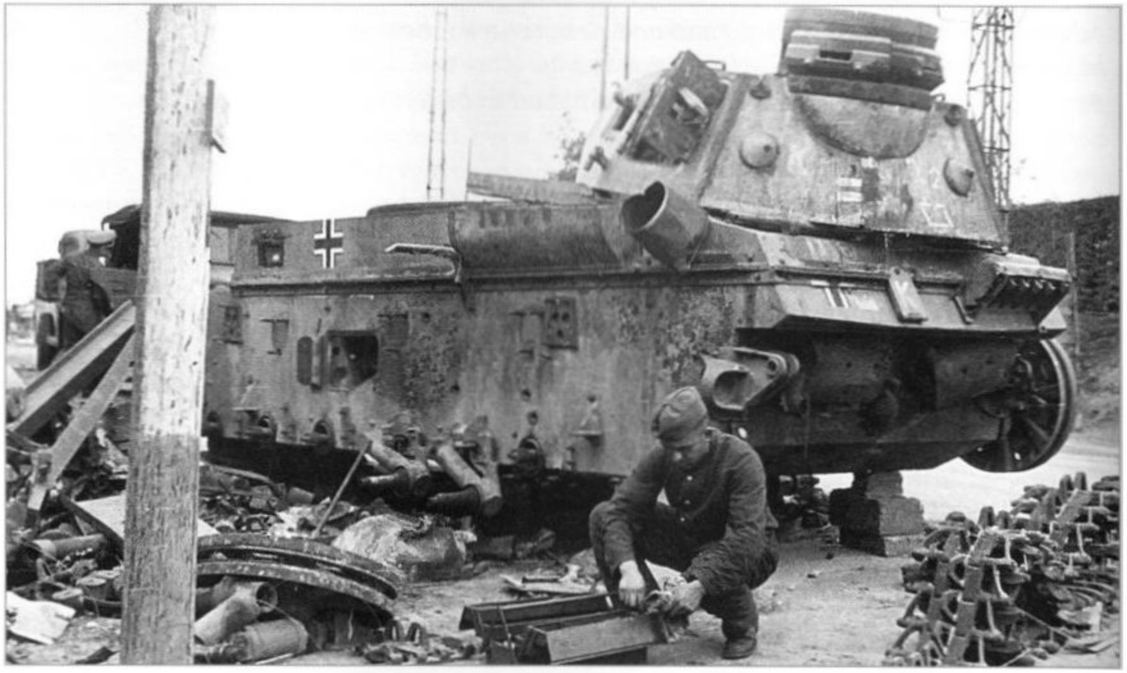
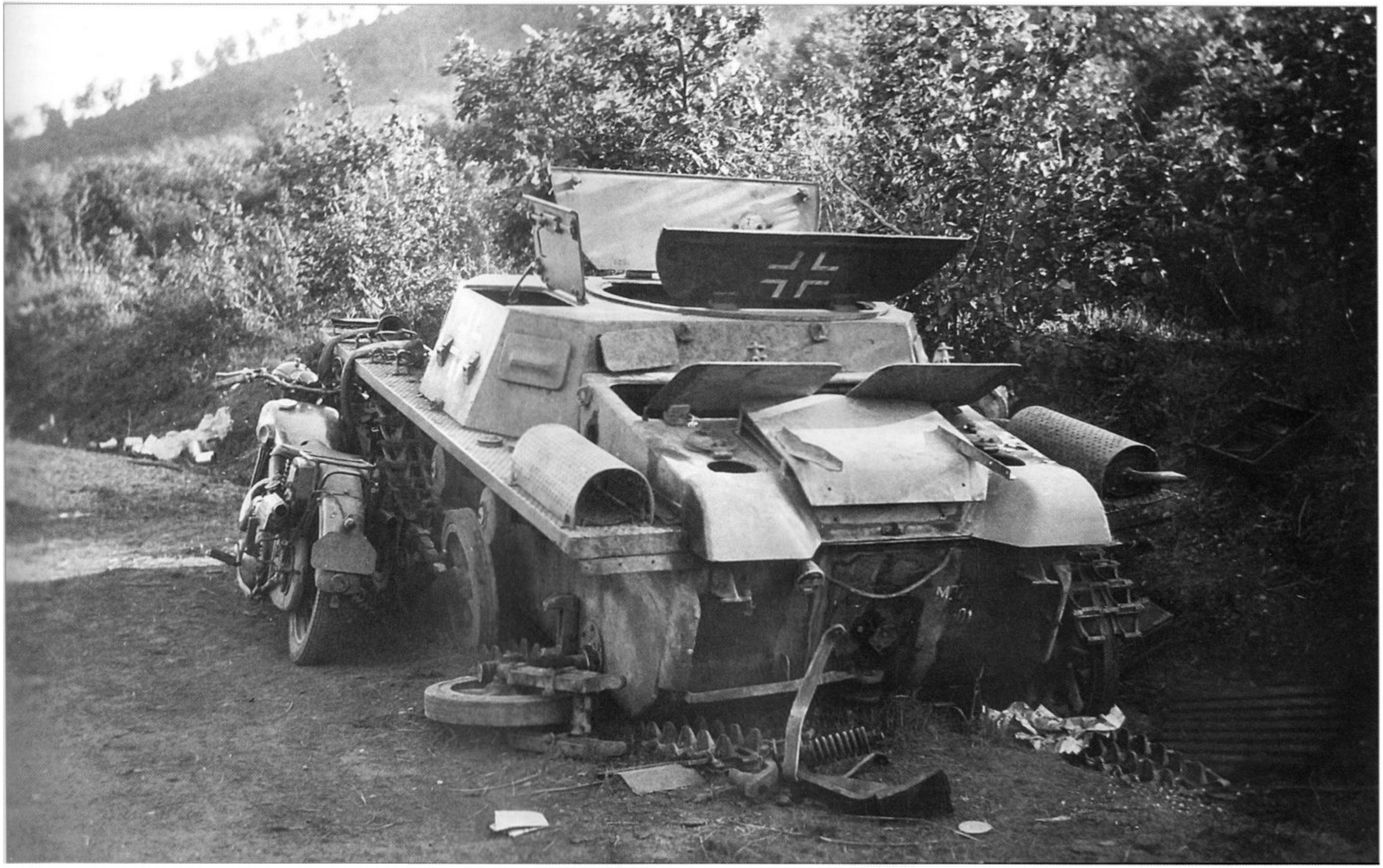
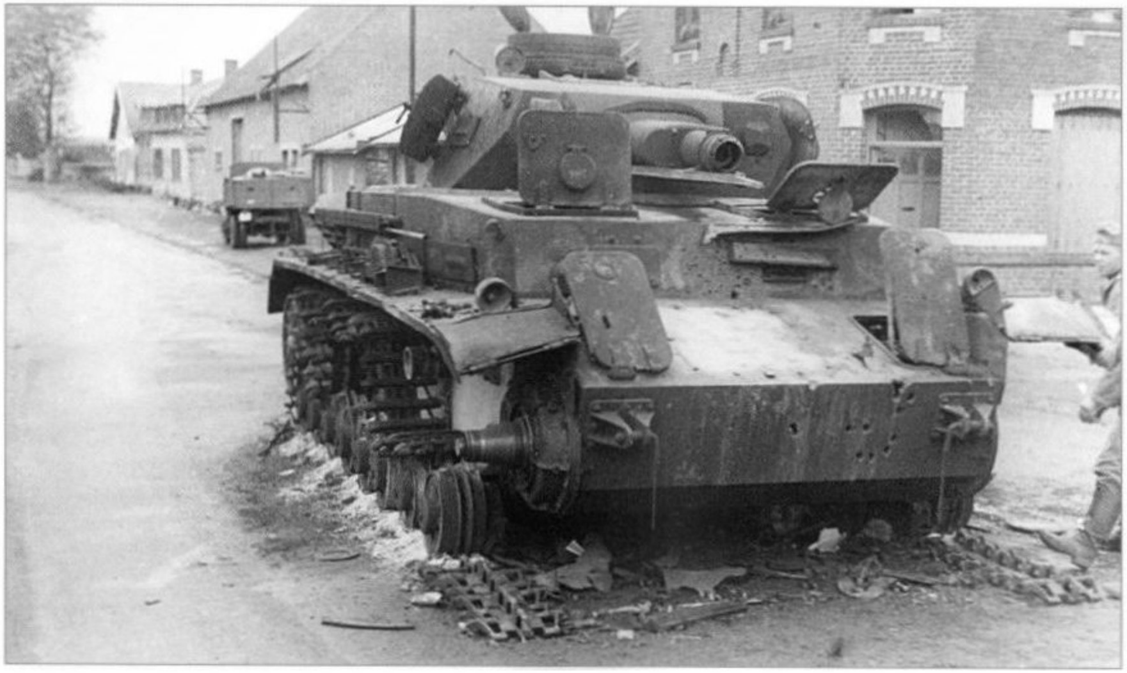
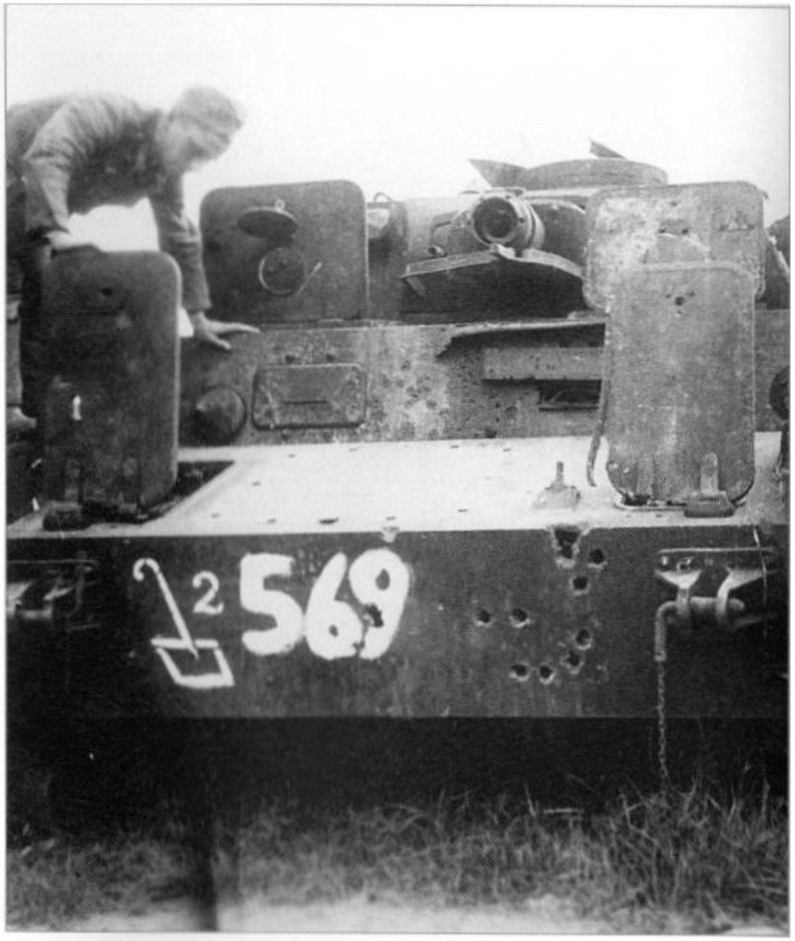

CAFE DES HECQUET

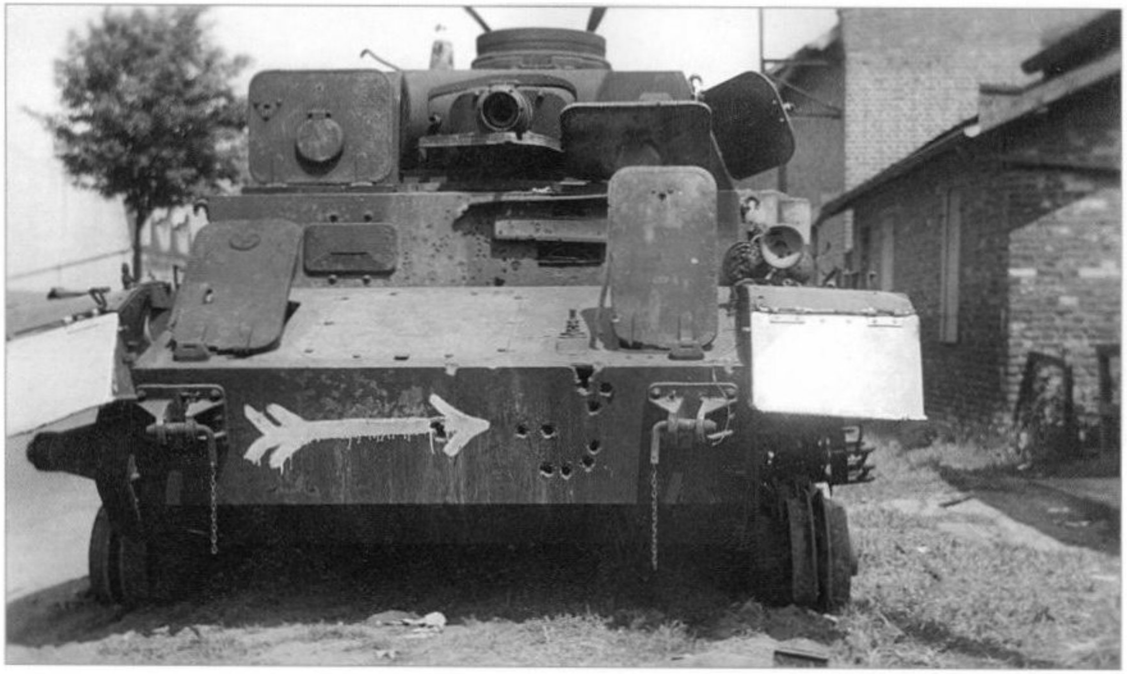




▲ An abandoned Panzerkampfwagen I (A) Munitions-Schlepper. The parts on the rear plate belong to a special tow coupling those ammunition carriers were outfitted with. *AMC*







A Pz.Kpfw.IV Ausf.B shot up in Arras, France 1940. Notice how the 'markings' change and what seems to be the base of a back-fitted Notek 'Tarnscheinwerfer'. *AMC, 2x LA* *had to drive relatively long distances (200 - 300km each way!) [The Panzer spare part depot Mons was ready on 27 May 1940]. After a few days into the second operation the distance increased so much (600km and more each way!) that the troops could hardly supply themselves with spare parts anymore. The more so as during the second operation the Panzer spare part depot Mons was very low on, and sometimes out of, the most necessary expendable parts ('Verschleissteile').*

Summarized Conclusion from Past Experiences:

From the experiences gained during the French Campaign, which are practically the same as from Poland, comes the compelling necessity of creating a Kfz.-Workshop System uniformly led by a central department of the Wehrmacht, structured already during peace time.

To this it is found important,

a. That in peace and war, Wehrmacht's own Kfz.-Hauptwerkstätten (Main-Workshops) exist beside the Truppenwerkstätten (workshops of the troops);

b. That the training of all men working in the I-Diensten and workshops is methodical and standardized by creating a specialist's career. For this, the specialists who are candidates should already be acquired by the Wehrmacht as apprentices ... and be trained methodically.

c. The experiences gained during the campaigns in Poland and France clearly showed that the Kfz.-Werkmeister are such a crucial backup of the army motorization, that it would be a mistake to leave the Kfz.-Werkmeister question answered in such a insufficient and unsatisfactory manner as is the case now.

Final Conclusions:

During the campaign in the west the supply was organized in a way that it could quickly adapt to the fast course of the operations and thus enabled the tactical leadership to make its decisions without constraint from supply problems.

The supply was facilitated by several favorable circumstances, such as good weather, generally good road conditions and the capture of large amounts of enemy supplies such as fuel, food, sanitary equipment and motor vehicles.

1941: The Balkan and Russian Campaigns

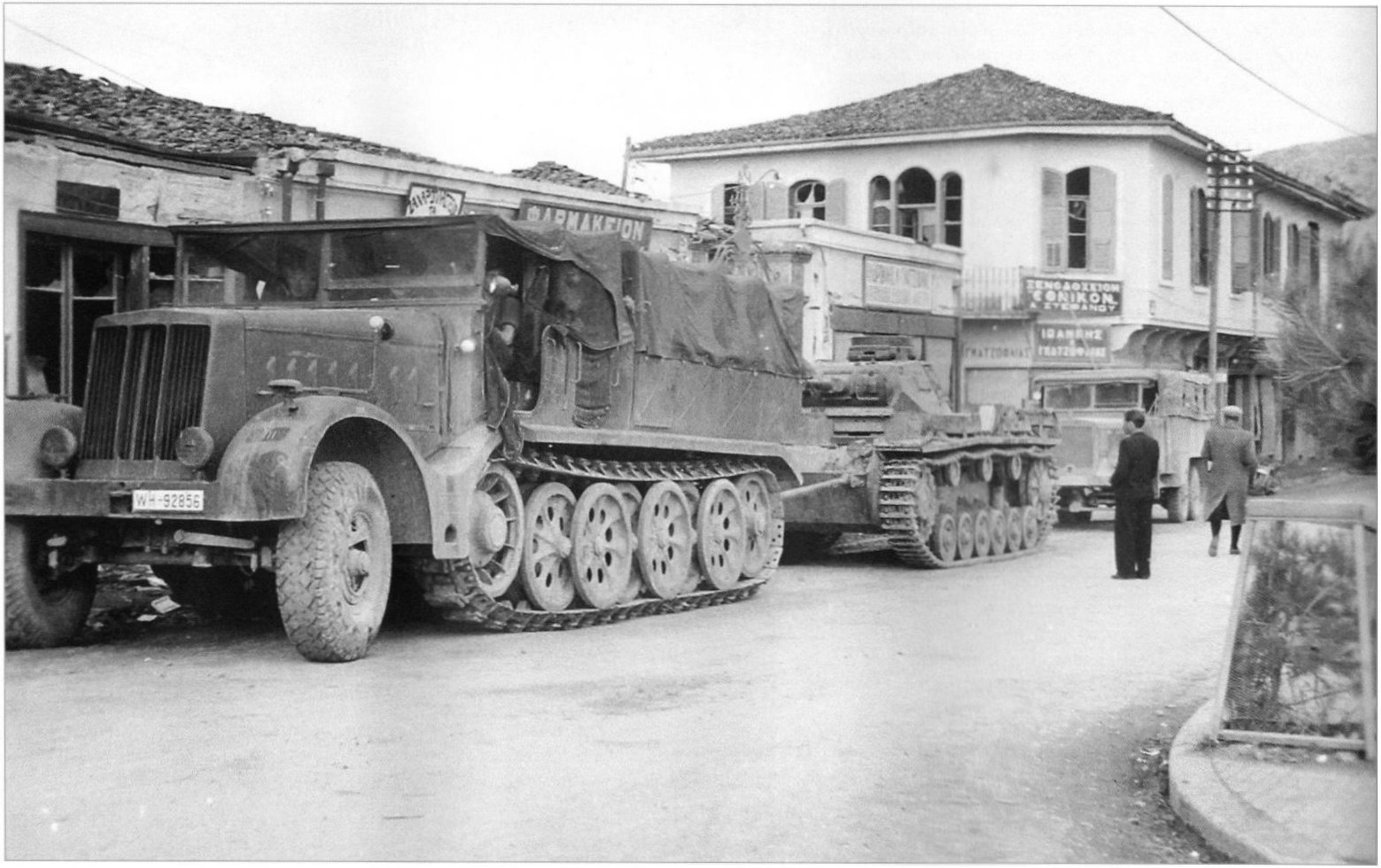
At the beginning of the year 1941, Colonel General Halder noted on 28 January 1941 that the spare parts situation got better and that replacement parts were mostly delivered on time. In his opinion, Panzer spare parts could be guaranteed if their priority level was raised from S to SS.

Exactly three month later though, he noted the statements of the Gen.Qu. who said that he had no Kfz. spare parts left. Everything was put into the formation of new units.

The Balkan Campaign in April 1941 tore a big hole in the spare part stock (Schell, 1942). Worse than the total losses of 56 Pz.Kpfw. was the wear on all Panzers, which suffered heavily in the mountainous terrain. The 9.Panzerdivision reported that, besides other losses, the brakes of all their Panzers were totally worn out. The 9.Panzerdivision could then also not be fully replenished until it took part in the Russian Campaign. Schell wrote in 1942 that the repair facilities and the corresponding organizations had proven themselves. Nevertheless the 'Amtsgruppe K' was aware that only 30 - 50 % of the mounting repair work could be done.

After the war, it was often said that, because of the Balkan Campaign, operation 'Barbarossa' was delayed and thus the German Army got stuck in the winter before it reached Moscow. This is not true. The invasion of Russia started on 22 June 1941, the second major campaign called 'Fall Blau' started on 28 June 1942, Operation 'Zitadelle' started on 5 July 1943 and the offensive in 1944 started on 22 June 1944. This demonstrates that a large offensive in Russia could not be launched before the end of June, and that the Balkan Campaign did not delay the initial start of Operation 'Barbarossa'.

Even during what were termed 'Blitz' campaigns, Panzer units had to be given time to maintain their vehicles properly. During operation 'Barbarossa' this time was lacking from the beginning. Because the campaign had not ended after a few weeks and the road and weather conditions in Russia ate away at the wheeled and tracked vehicles in a manner never seen before, the missing time


ΦΑΡΜΑΚΕΙΟΝ
WH-92856

▲ A Zugkraftwagen 18t is towing a Pz.Kpfw.III Ausf.F of 9.Pz.Div. in Greece. The towing bars seem to be the lighter version. *AMC* for routine maintenance had much more of a negative impact than before. On 16 July 1941, 10.Panzerdivision reported to the XXXXVII. Pz.Korps:

> *During the last 100km, 24 Panzers broke down, their engines irreparable, because of a build-up of dust never seen before. This dust, which cannot be kept out by air filters, has such an abrasive effect, in conjunction with engine oil, that there is a sharp drop in power and the engines are no longer able to propel the Panzers forward.*

The state of the 18.Panzerdivision was even worse, as a situation report of 20 July 1941 shows:

Marching-out strength:	*210 Panzers (100%)*
Total write-offs:	*37 Panzers (18%)*
Available for assignments with reservations:	*47 Panzers (22%)*
In need of repair:	*126 Panzers (60%)*

The Guidelines for the Command and Deployment of a Panzerdivision from 3 December 1940 said:

> *After 4 - 5 days of operation, the armored units must be given the necessary time to prepare for action once again.*

Where the disregard of that basic principal led can be seen in the KTB entry of H.Gr. Middle from 22 August 1941:

> *The armored units are so battle-weary and worn out that there can be no question of a mass operation until they have been completely replenished and repaired.*

Such a pause was granted in August 1941. But, shortly after that, as if to cap it all off, the mud period set in and the spare part supply began to dry up. Break-downs due to the lack of spare parts reached hitherto unknown proportions. For example, the 18.Panzerdivision lost 59 Panzers due to enemy action and accident, but 103 Panzers because of spare parts shortage. Fully operational were 30 Panzers, which is about 12% of the total strength. Until then, the Panzers had driven approximately 4,000km in very difficult territory and climate without the necessary rest for maintenance. (Div. Ing. 18.Panzerdivision in a report from 4 November 1941).

After the beginning of operation 'Barbarossa', Colonel General Halder, who among others drafted the plan for the invasion of Russia, noted:

8 July 1941

> *The Führer explained that he wanted to hold the newly manufactured Panzers back to have brand new equipment for upcoming tasks because these will again reach over thousands of kilometers. The current losses on the front will lead to the consolidation of Panzer-Divisions. The freed personnel will then be equipped in the homeland with the brand new Panzers.*

23 July 1941

> *General Buhle: Panzer losses are generally satisfactory. The average total losses are 20%. Partial losses up to 50%! Motor vehicle situation generally satisfactory. An 8 - 10 day pause for replenishment is requested for 'schnelle Verbände' (motorized units). At the moment it is impossible!*

24 July 1941

> *General Buhle: It is absolutely necessary that the Panzer-Gruppe 2 and 3 get an approximately 10 day break for replenishment before any new operation can be launched.*
> *Then it can be expected that the divisions will have 60 - 70% of the Panzer stock from 22 June 1941 operational again. Heavy losses of engines occurred due to dust since crossing the Beresina.*
> *Some Panzerdivisions shall be cannibalized to strengthen other divisions. Then we can arrive at Charkow with 50% of the Panzers operational. Considered are the 16.Panzerdivision of Gruppe 1, the 17.Panzerdivision of Gruppe 2 and the 20.Panzerdivision of Gruppe 3.*
> *Even after such a replenishment, more technical break-downs than before must be expected, because the engines suffered considerably under the dust.*

The situation of Panzer-Gruppe 1 and 4 are similar.
New attacks can thus not be launched before 5 August 1941. Spare parts, especially engines, must be supplied on time.

29 July 1941

Gen Wagner (Gen.Qu.): Engines for 80 Kampfwagen III and 30 Czech 38t have arrived (Requested were 250). Specialists have arrived at the front.

19 August 1941

Kfz.-situation: 2/3 operational. Generally enough. Panzer situation: On average 60% operational, very tight.

28 August 1941

On day 68 of the campaign, the Kfz. shortage on 16 August was: 38,000. 1/2 are allotted to 'schnelle Truppen', 1/4 to army troops and 1/4 to Infanteriedivisionen.
Panzer situation:
Pz.Gruppe 1: On average 50%
Pz.Gruppe 2: 10.Pz.Div. 83%, 18.Pz.Div. 57%, all other Pz.Div. on average 45%
Pz.Gruppe 3: 7.Pz.Div. 24%, all other Pz.Div. on average 45%
Pz.Gruppe 4: The best (Czech) on average between 50 - 75% operational

14 September 1941

On day 85 the Panzer strength of Pz.Gruppe 2 was reported as follows: 3.Pz.Div. operational 20%, 4.Pz.Div. operational 29%, 17.Pz.Div. operational 21%, 18.Pz.Div. operational 31%.

18 November 1941

On day 150 of the campaign, 150,000 Kfz. out of 500,000 Kfz. are total write-offs. New production until April 1942 amounts to 60,000. This means that 90,000 have to be saved by reorganization. 275,000 Kfz. need repair. For this 300,000to of spare parts are needed.

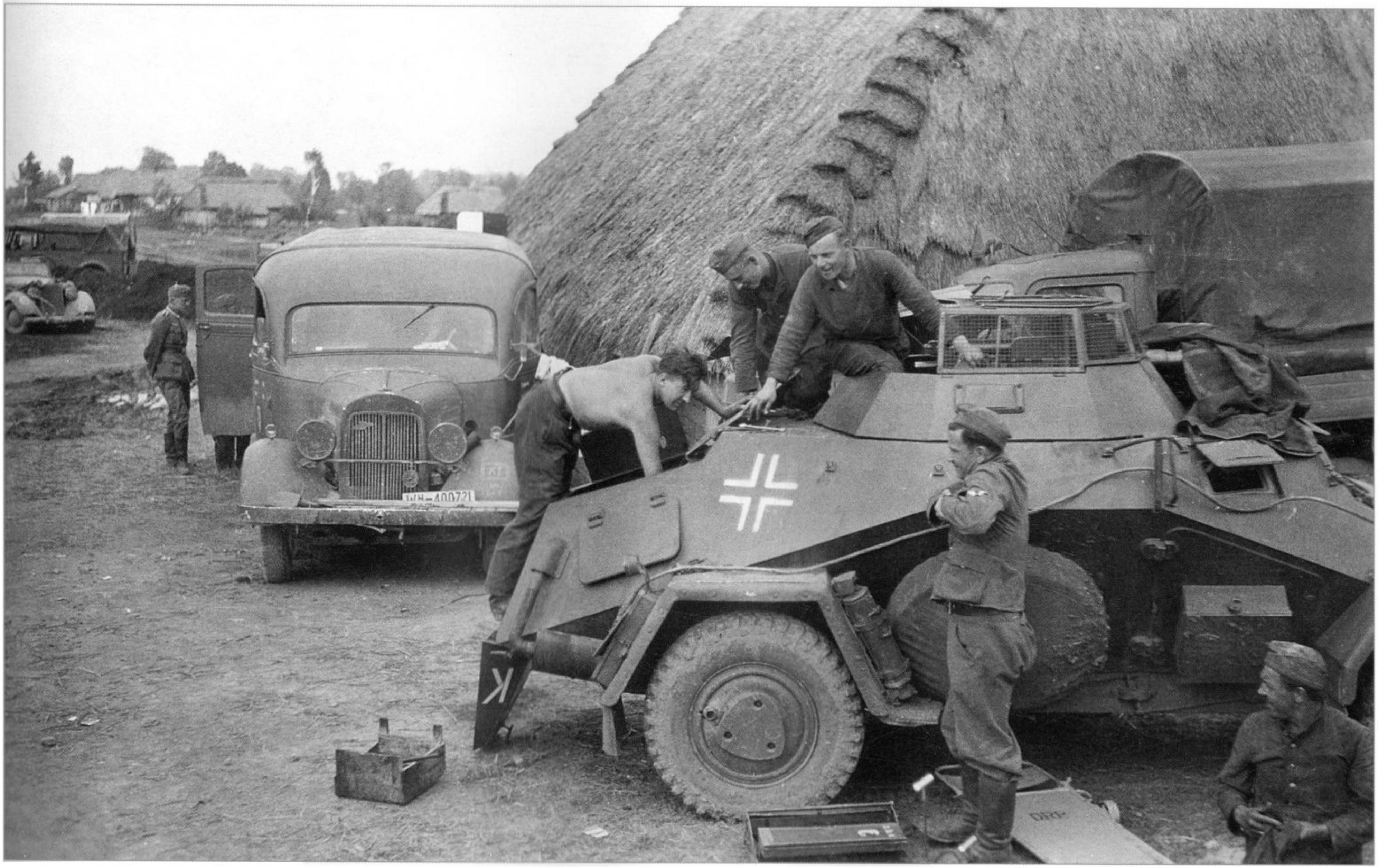
The notes taken on the next day say that out of these 500,000 vehicles 30% were beyond repair, 40% needed a general overhaul and 30% needed smaller repairs or were operational.

The 18.Panzerdivision retreated from the front line during the night of the 28 July 1941 to a replenishment area by Potschinok (Smolensk). On 1 August 1941 the regrouping was effected. About this, the division's commander reported to the Panzerkorps on 10 August 1941:

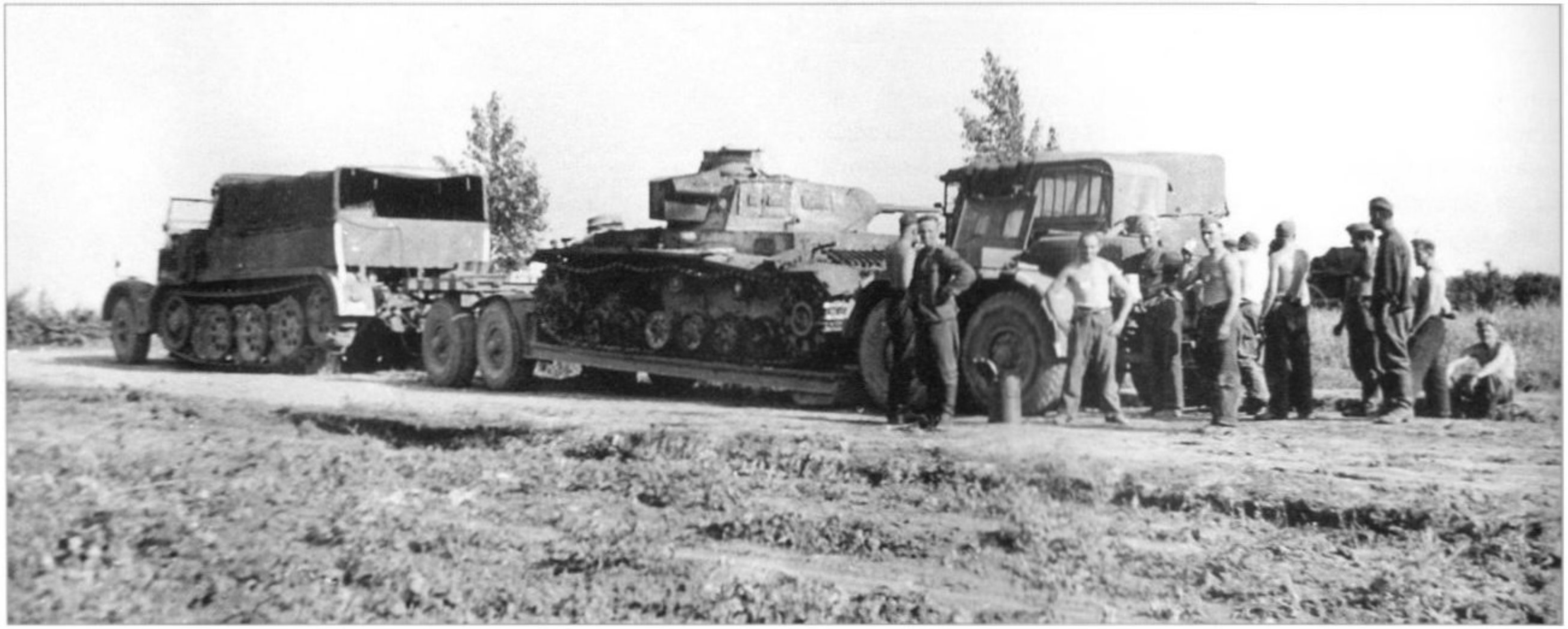
> *Due to the losses of personnel and equipment, especially of Kfz., the division is forced to suspend one Panzer-Abteilung and one Schützen-Regiment and to decrease the existing units by a company each. The current stock of Pz.Kpfw. is currently 99 including Panzerbefehlswagen. It can probably be raised. 50% of the available Pz.Kpfw. are fully operational, the other 50% are only conditionally operational due to engine abrasion.*
>
> *The Kfz. situation is worse. The Kfz. suffered heavily with the very bad road conditions and the tremendous amount of dust, especially the French makes, with which the division was equipped to 40%. The Kfz. that are still operational are mostly unreliable and thus only serviceable with reservations.*
>
> *Reason: Missing spare parts including engines, no possibility for general overhauls, unsuitability of the French vehicles for these kinds of conditions. A possible supply of a larger number of piston rings could increase the range of the division to maybe 500 - 600km. A better supply of oil is crucial because all Kfz. have higher than the usual consumption due to the dust wearing down the cylinder, especially the Panzers.*

The 18.Panzerdivision wrote a status report to the 47.Panzerkorps dated 31 October 1941:

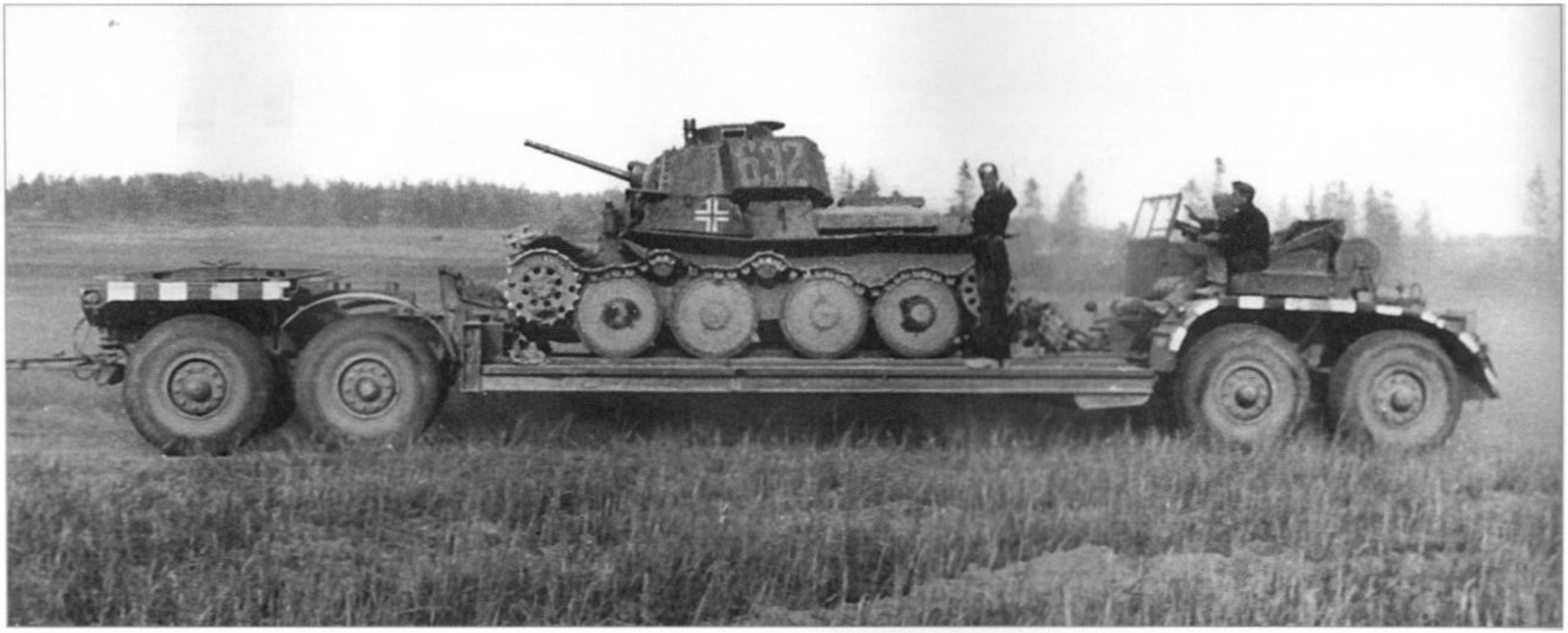
> *Of the still operational Pz.Kpfw. only the 14 newly assigned Pz. Kpfw.III have a kilometer reading below 2,000km. All others are old vehicles that have been with the division since the beginning of the Russian Campaign and have driven an average of 4,000km. Especially strong fatigue of the springs and torsion bars occurred lately. These often result in long break-downs of the Pz.Kpfw.*



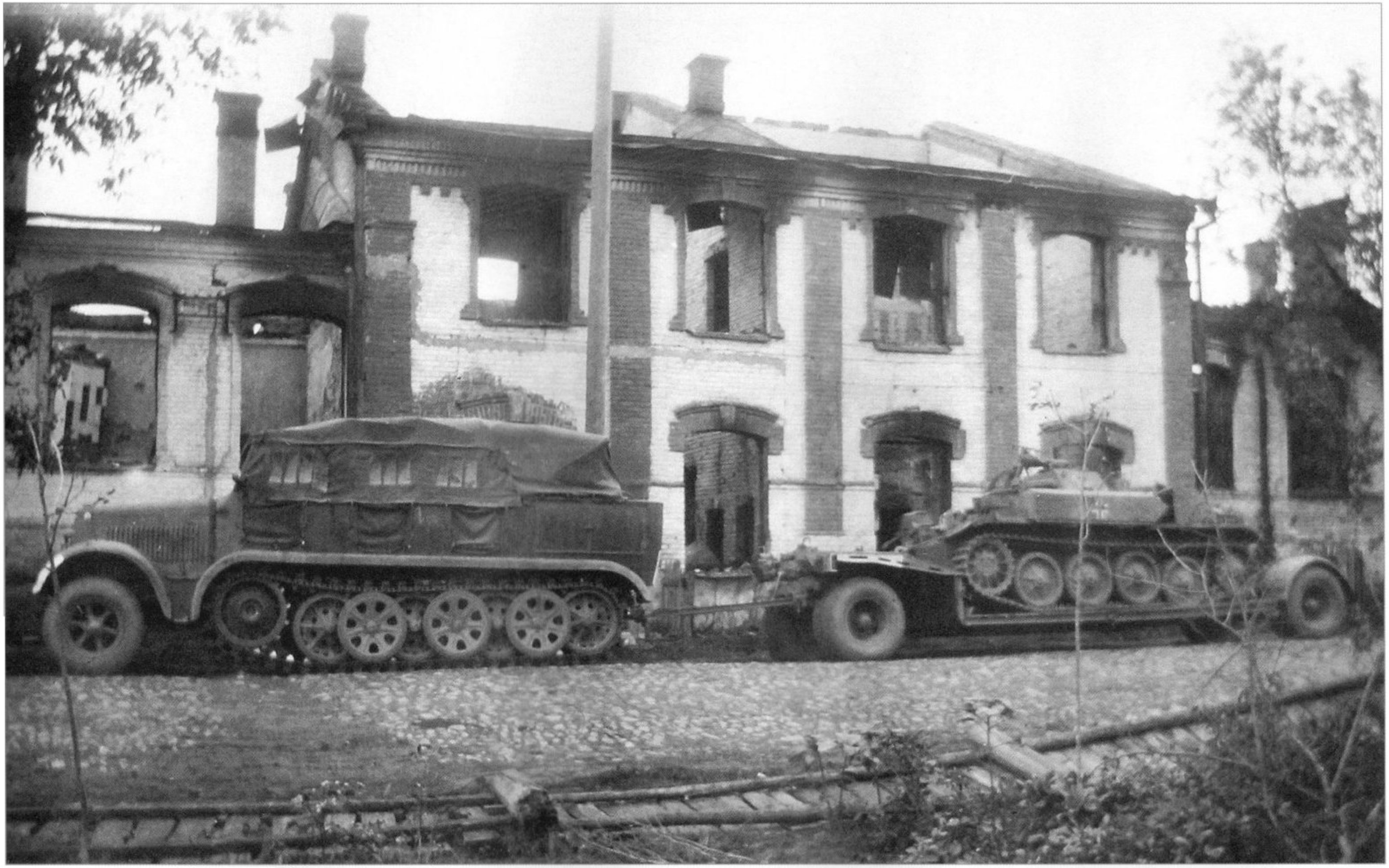
▲ A 3.Serie le.Pz.Sp.Wg. (2cm) (Sd.Kfz.222), back fitted with a 2cm Kw.K.38 enclosed with a higher screen. Interesting is the mechanic's creeper board being used in the field. *HE*



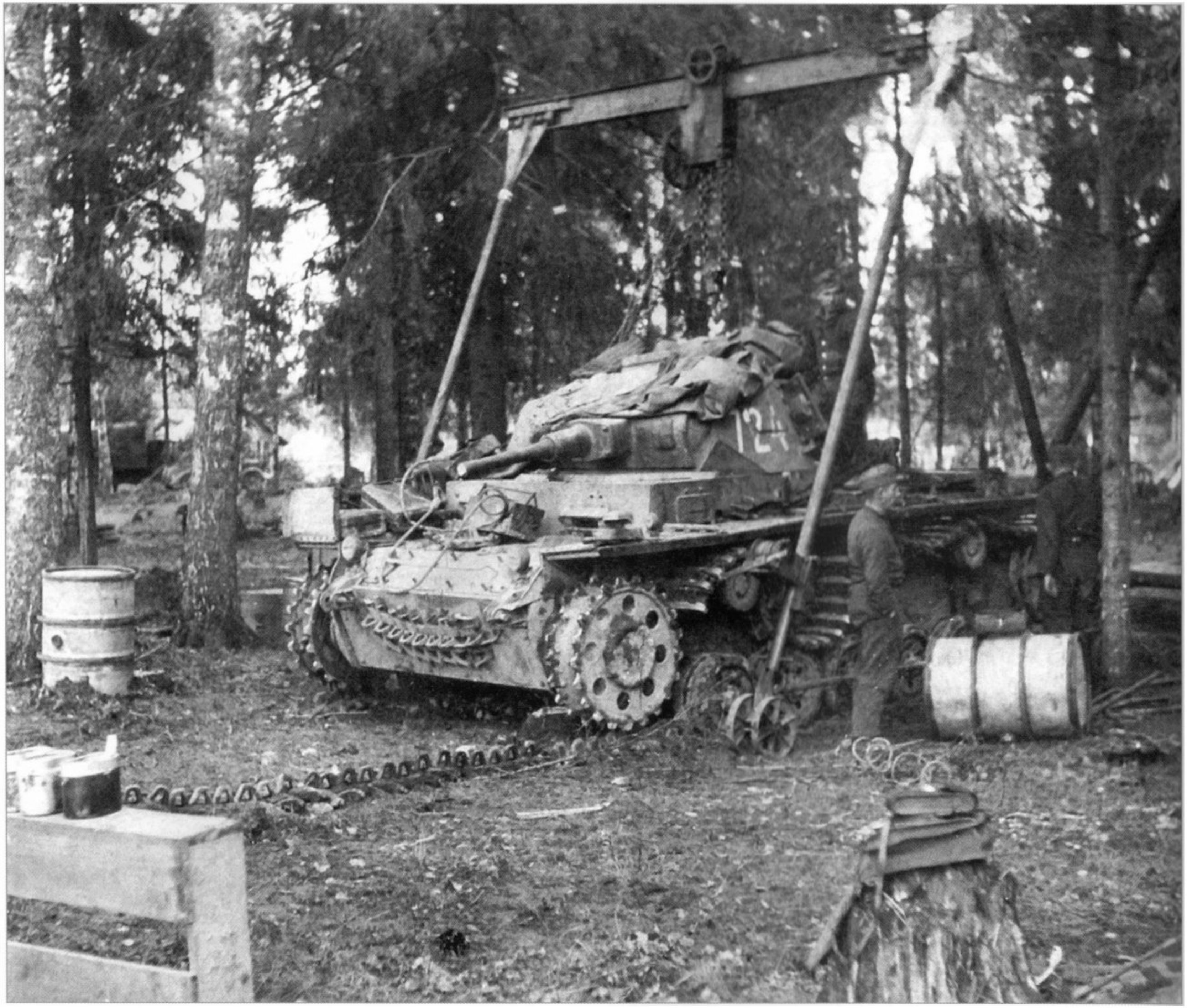
▶ A burnt Pz.Kpfw.III is recovered with a Sd.Ah.116. Luckily, the road is dry. The photo reads that it was taken at 'Koliof'. *AMC*



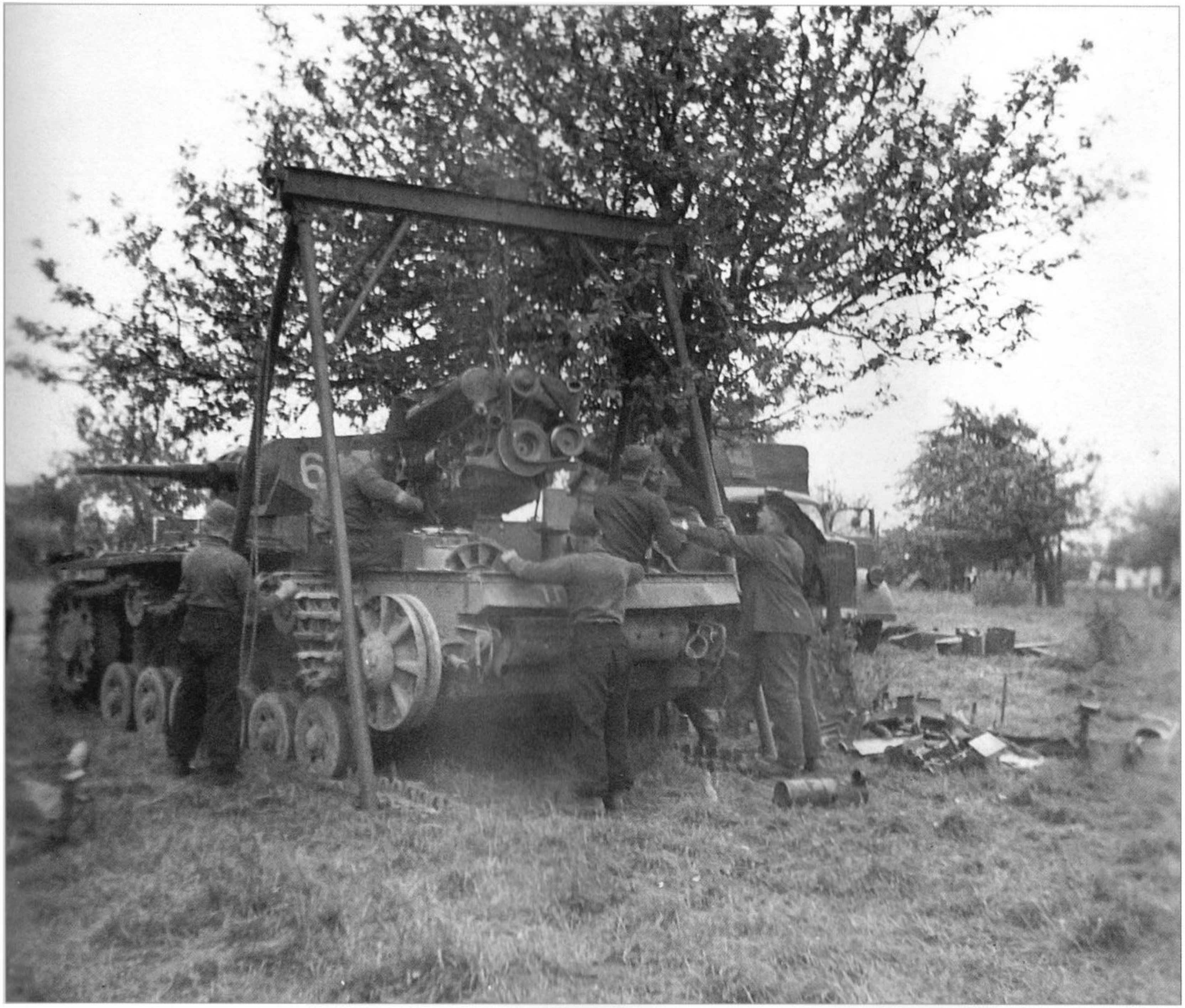
▶ At barely 10to, the Pz. Kpfw.38(t) was a lightweight for the Sd.Ah.116 that was originally constructed to carry a load of 20 and later 22/23 tonnes. *TG*



▲ A Pz.Kpfw.II Flamm. is being recovered by a m.Zgkw.8t Ausf. m 11. *AMC*



▶ This crane, towering above a Pz.Kpfw.III Ausf. H, has a trolley with integrated hoist. Nothing is known about it with certainty, but AHM No.10 from 21Jan42 mentions two gantry crane versions, one of 1,5to capacity and one of 5to capacity. *AMC*



◀ One is tempted to assume this most common crane had a 1.5to capacity, however, without changing its appearance, the beam, hoist, chain or hook could have different capacities. *AMC* *because not enough replacement parts could be supplied.*

- *Despite replacements and overhauls, many engines are in need of an overhaul again. The modification of the air-intake, which became urgently necessary, could so far only be carried out on one vehicle. No experiences have been made yet.*
- *The high number of break-downs of Pz.Kpfw.IV is caused by broken crank shafts. After long use they distort and then break due to fatigue.*
- *Many Pz.Kpfw. tracks are stretched which results in their running off the sprocket.*
- *The shock absorbers of the Pz.Kpfw.III often tear off because of the bad roads. Not least of all do they tear off because only inadequate maintenance could be performed due to the insufficient supply of shock absorber fluid.*
- *While the road wheels of the Pz.Kpfw. could mainly be replaced on time, the ball and roller bearings are worn out because no replacements could be supplied.*
- *Many short-term break-downs occur due to dirty fuel pipes because the fuel tanks need to be cleaned. For this, the [fuel} tanks must be dismounted which requires two days of work. Because all vehicles are severely worn, they are in need of a major overhaul.*

The Panzer situation must be called very critical - with regard to the quantity as well as the quality.

Kfz. 'target' according to the K.A.N. = 5,461 vehicles
Kfz. 'actual' according to the regrouping = 4,025 vehicles
Already six weeks after the regrouping of the division on the 14 September 1941, only the following vehicles were still operational:

Motorcycles	*142 (11,7%)*
Pkw	*316 (22,0%)*
Lkw	*454 (25,5%)*
Zgkw.	*84 (53,5%)*
S.P.W.	*15 (93,6%)*
Pz.Spähwg.	*9 (90,0%) of the strength*

	from 22 June 19
Total:	*1,020 vehicles.*

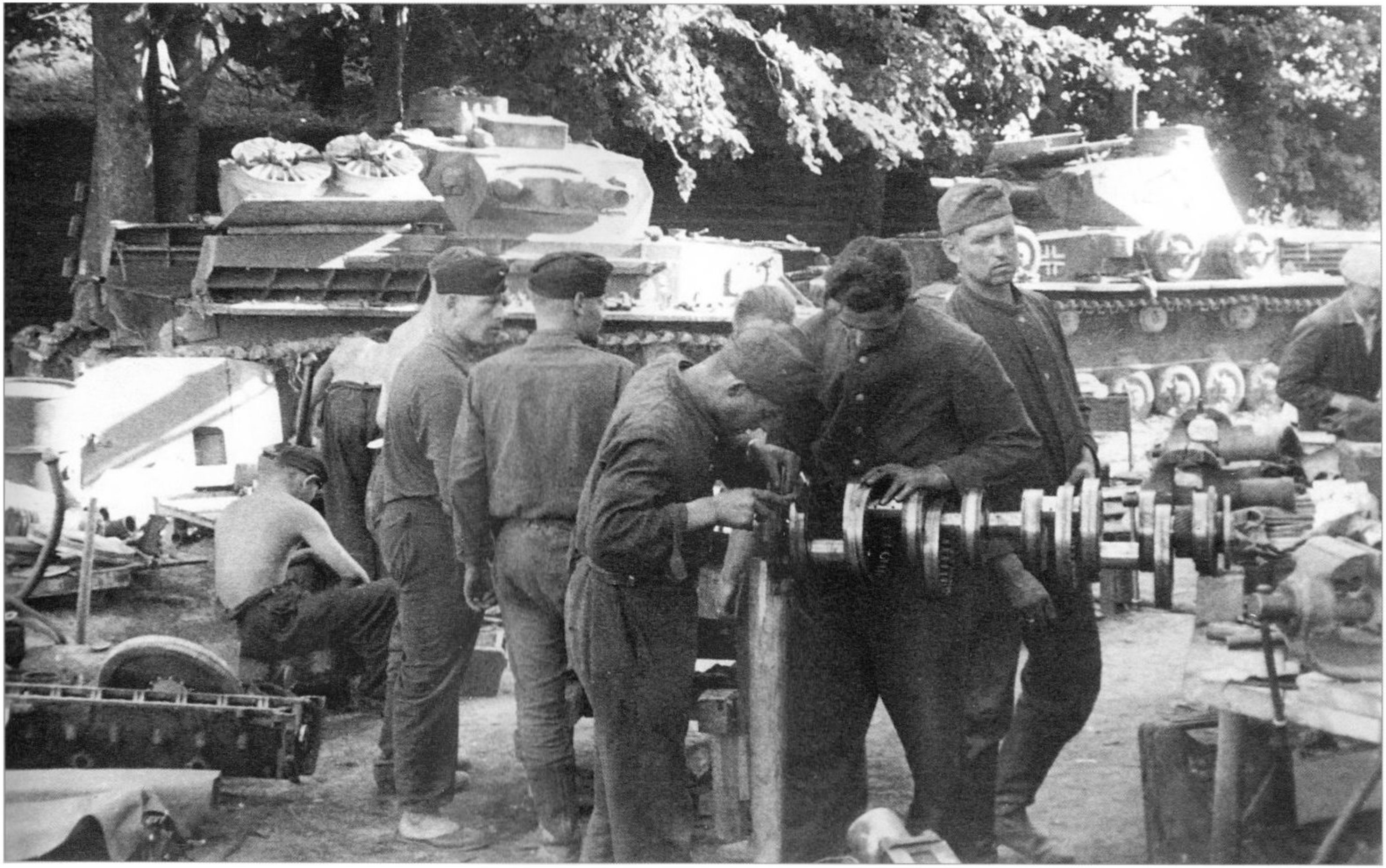
The good situation of S.P.W. and Pz.Spähwg. is explained by the fact that the S.P.W. were newly assigned shortly before this report and the Pz.Spähwg. are few in numbers. So on 15 September 1941, the division had 27% of its wheeled vehicles operational. On 31 October 1941, this number rose to 35% due to:

1. *Replacements. But it must be noted that most of the replacements were not new vehicles but repaired ones that already suffered considerably on their march to the unit. Additionally, many vehicles are of French origin and not suitable for the campaign in the East.*
2. *Thanks to the replacement of the piston rings, a part of the 'Ölfresser' ('oil eater') could be made serviceable again. However, this procedure cannot be repeated a second time because the cylinders are worn down too far. It must be noted that in at least three weeks the high oil consumption will reoccur.*

Most critical is the Lkw and Zgkw. situation. The loss of 2/3 of the transport capacity has three catastrophic implications:

1. *It is impossible to carry all weapons and equipment. In the Artillerie-Regiment 88 2 - 3 guns per Abteilung cannot be towed anymore. Additionally, the regiment must leave behind 40% of the initial stock of ammunition.*
2. *The troops can carry along only 3.8 'Versorgungssätze' (supply portions) instead of 6. On Russian roads, which can only be described as open country, only 250km instead of 475km can be covered.*
3. *The supply units cannot fulfill their assignments anymore.*

The 'Zentra Kraft Ost' wrote in their retrospective that in the period from 1Jun - 26Aug41 a total of 5,339to of spare parts was sent to sector North (ZEL 112 Pleskau); 6,231to to sector Middle (ZEL 106 Borrisow) and 10,915to to sector South (ZEL 306 Berditschew).



▲ Wkst. personnel at work on a crankshaft. Crankshaft grinders were very valuable machines for the Wkst. troops and many reports contain complaints about the lack of these important machines. *HE*

▲ Hiwis are helping recover a StuG. Notice that one does not wear shoes. The Germans employed a lot of Russian volunteers, often more than the 'Soll-Stellen' allotted. *AMC*

1942: New Hopes, the Second Thrust

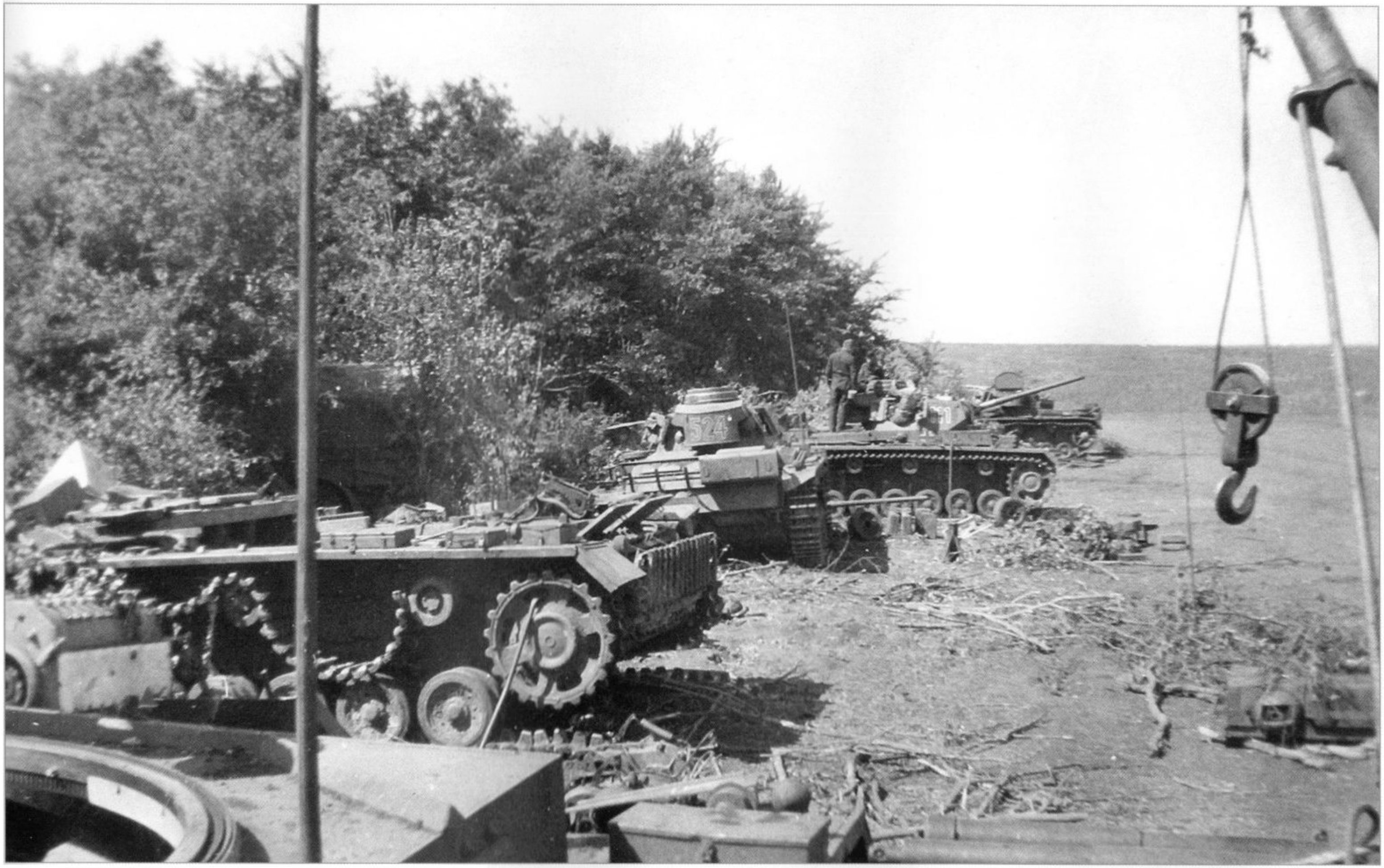
At the beginning of 1942, the OKH sent questionnaires to all divisions in order to gain insight into why the Blitz campaign against Russia failed. In regard of the high number of break-downs due to the lack of spare parts, on 12 March 1942 the command staff of 4.Panzerdivision made their point very clearly:

> *The higher command echelons became used to acknowledging appeals for help from units concerning spare parts for vehicles and so on, without taking any steps, because our luck continued to hold regardless and the divisions achieved what was supposed to be impossible.*
> *This led to the fact that on 5 December 1941 (the day before the start of the withdrawal), the Division had at its disposal only: 15% of its Panzer; 30% of its Pkw; 34% of its Lkw and 10% of its motorcycles.*

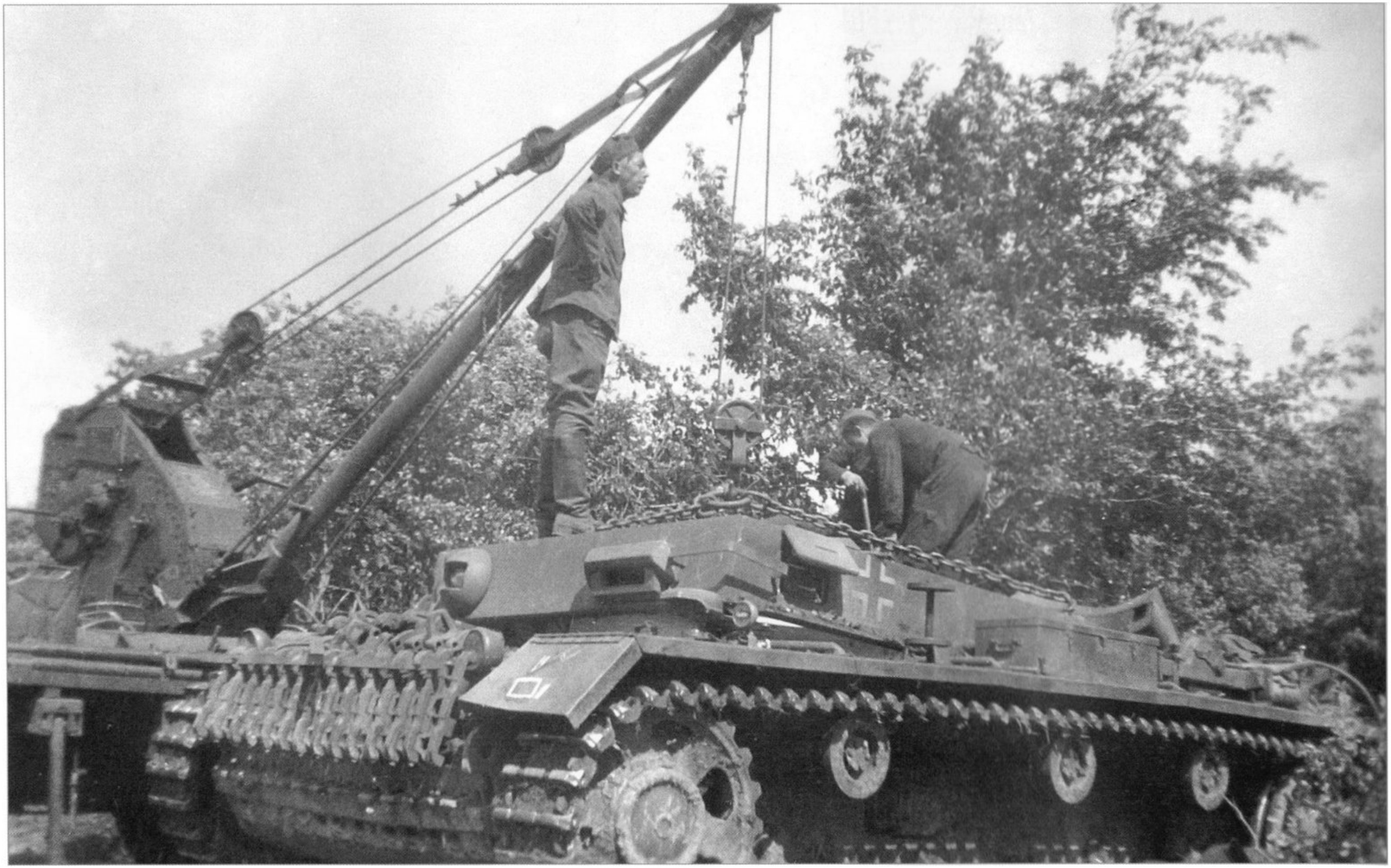
On 21 April 1942, Colonel General Halder noted for a presentation about the effects of the winter war (period 1 October 1941 - 15 March 1942) for Hitler

> *Losses amount to 74,183 Kfz. and 2,340 armored vehicles. Replacements amount to 7,441 Kfz. (10%) and 1,847 armored vehicles (80%).*
> *Equipped with Panzers: H.Gr. South: almost full. H.Gr. Middle and North: 1 Abteilung per Panzer-Division.*

The principal task of the upcoming major offensive starting in June 1942 was assigned to H.Gr. South. The objective of 'Fall Blau' was to capture the railroad junction in Stalingrad and the old fields of Maikop and Baku. For this reason H.Gr. South had priority in replenishment, as is shown by Halder's note above. However, the spare part supply documented by Zentra-Kraft-Ost from 10 April 1942 does not show such a prioritization.

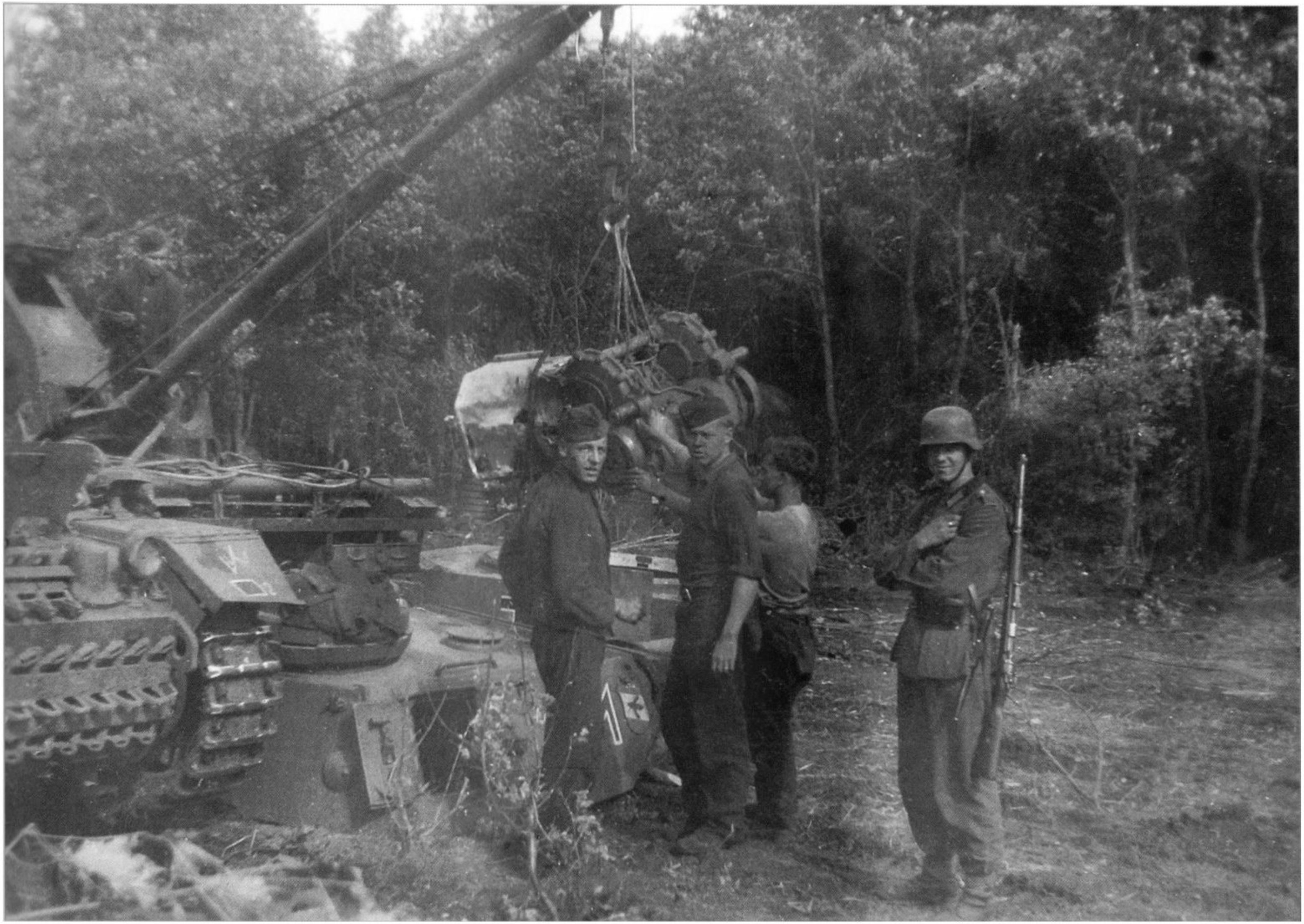


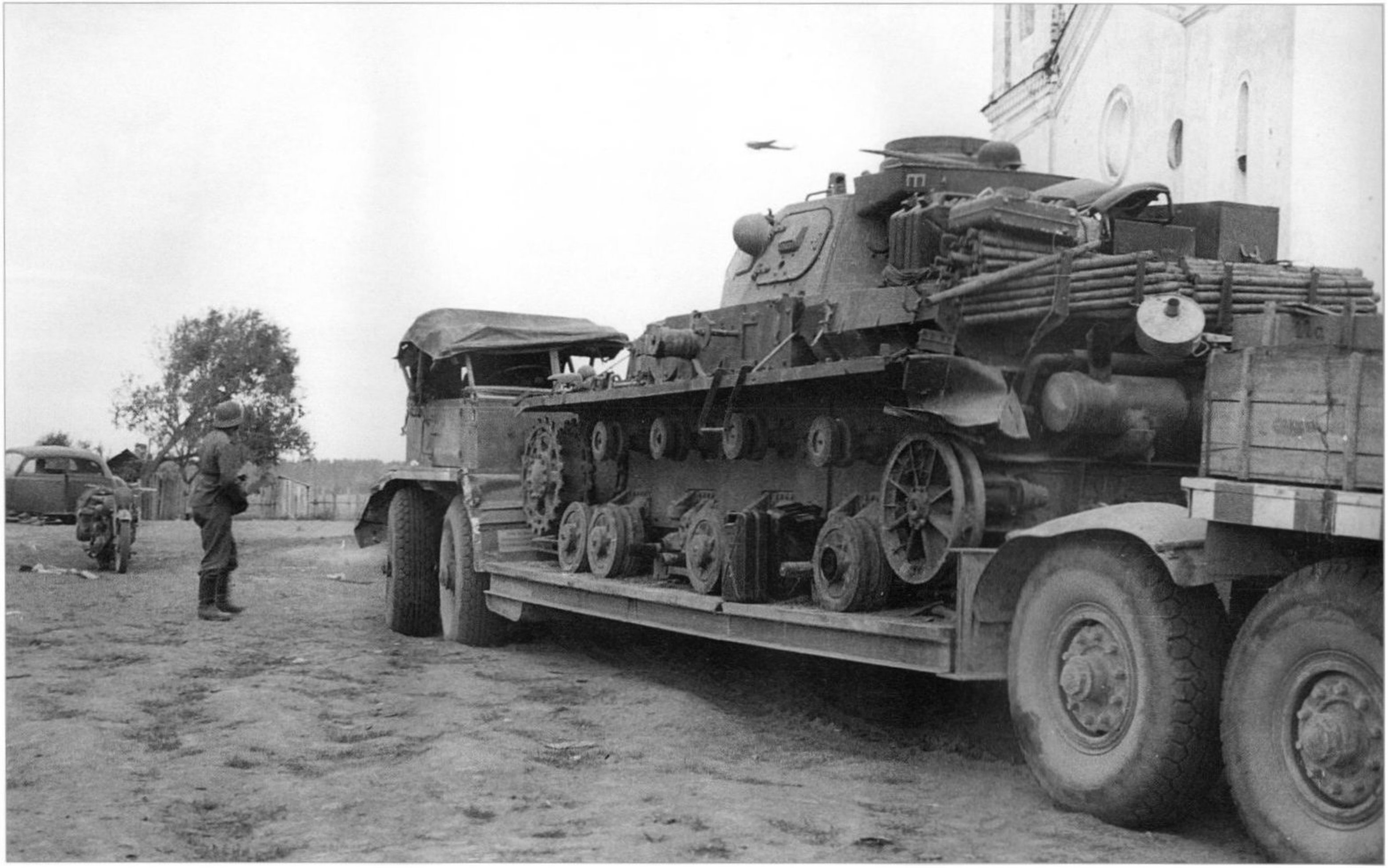
▲ Three photos of a Werkstatt in the field. Even though there are some symbols and turret numbers visible, the unit remains unidentified. Notice the extra stowage boxes this unit installed on their Pz.Kpfw.IIIs. *AMC*



▲ The Kfz.100 with its 3to crane was essential for a quick and smooth repair job. Note the extra layer of spare tracks mounted on the front. Another field modified spare track bracket is welded around the left front corner of the superstructure. *AMC*

▶ The guard with helmet and rifle as well as the attention paid to camouflage suggests the photos have been taken close to the front line. The Pz.Kpfw.III could be an Ausf. J or L. *AMC*





▲ A Pz.Kpfw.IV of 20.Pz.Div. in Russia. The unit can be identified by the unit insignia on the turret stowage box as well as by the two holders for spare road wheels on the left side of the superstructure. *JH*

▶ Some points listed on these signs are: HKP 627, Pz.Ersatzteillager A, Parkstaffel Nord, Inst.Komp.210, a booty collection point, a scrap depot, various other depots, several RAD units, a SS Police base, a Stokraft, the Ortskommandatur, etc. *WA*

	North	Middle	South
Total available since start of the campaign	20,063to	52,055to	27,906to
Distribution to the troops since start of the campaign	14,551to	30,494to	17,239to
Total stock on 10 April 1942	3,897to	18,333to	5,384to
+ Extra mission	1,286to	2,828to	2,340to

Speer noted on 4 December 1942 about meetings with the Führer on the three consecutive days before:

> *Pointed out to the Führer, that a fragmented deployment of the Henschel-Tiger brings substantial disadvantages with itself. ...*
>
> *From the beginning, the supply of spare parts is intended to only be extremely small. For every tenth Panzer a transmission, an engine etc. would be supplied, in order to not reduce the output of new vehicles. With fragmented deployment this small spare part assignment would lead to the complete loss of the vehicles in need of repair.*

Nähe Krieg. Laz. III
Beutesammellager an den Sud-Kasernen
HKP 627
Park Staffel Nord
HBD - Mitte im Hochhaus
K. II - Stokraft
K. A. S-Sammelstelle
Stab Rittmeister Schu Schrott-Lagerplatz
ϟϟ-u. Polizei Stützpunkt
23
Pz.-Ersatzteillager. A.
Flak-Jnft.
KL. LAGER LGK II
HML Mignon
Vers.Abschn.Minsk
(Umschlagstab Wien)
AD. Gr. 28
RAD 6/141
L 38541
RAD 195
Nach Borissow-Smolensk
MosKau
Nach Molodeczno Wilna
Nach Tscherwen Mogilew
Nach RaKow
Bobruis
Wehrmac
Ortskommand
RAD Stab H.5
Jnst. Kompanie 210
L 30985

1943: Last Big Offensive in the East

On 12 February 1943, Emil Leeb (Chef 'Heereswaffenamt'), wrote in regards to spare part supply:

> *The increasingly difficult spare part situation has caused the general staff of the army already several times to request a considerable increase of spare parts production before the production of complete units.*
> *The HWA almost daily receives reports about difficulties with spare parts supply.*
> *The HWA therefore needs to always have a clear overview of the spare parts situation and their future structuring. For this the HWA subordinated the 'Ersatzteilstab' (spare parts panel) to the Amtsgruppe WuG.*

Leeb stated in the report that he wanted to be informed by WuG on the 5th of every 2nd month about the current spare part situation with a special focus on the bottleneck spare parts. The reports had to include the number of orders, the completed deliveries, schedule of future deliveries and a comment if the AHA agreed.

From the presentation notes of the Panzeroffizier of the Chef/GenStdH from 7 July 1943:

▼ No less than 5 Zgkw.18t are needed to recover a Ferdinand. If you compare that number to the number of authorized Zgkw. for a whole Pzj.Abt., you realize the absurdities of tank recovery. *MJ*

Spare parts supply for Pz.Kpfw., status 7 July 1943, 9:30 o'clock:

1. *Tiger transmissions for H.Gr. Middle*
   H.Gr. Middle has already requested 28 Tiger transmissions (Henschel) for 22 Tigers broken down due to transmission failure. Tiger transmissions are in stock neither in the spare parts depots nor the homeland. Ten transmissions have been taken from the series production and made available in Kassel. Additionally, two special mechanics are sent along, who supposedly can repair a part of the damaged transmissions with single parts on site. Momentary difficulties: Procuring the necessary aircraft. Gen.Qu. tries to supply them. The result is not known yet.
2. *Panther engine and Panther spare parts for H.Gr. South*
   Oberstltn. v. Grundherr requested the following spare parts for Pz.Kpfw. Panther:
   Ten engines, five sets of tracks, 100 road wheels bolted, ten idlers with ball bearings, four complete drive sprockets with gear rims, 20 complete fuel pumps, 50 seals for fuel pumps, five water pumps for Maybach HL 230. The ten engines are available in Friedrichshafen. The rest of the spare parts will probably be sent by rail transport (Blitz). Problems with getting aircraft as well.

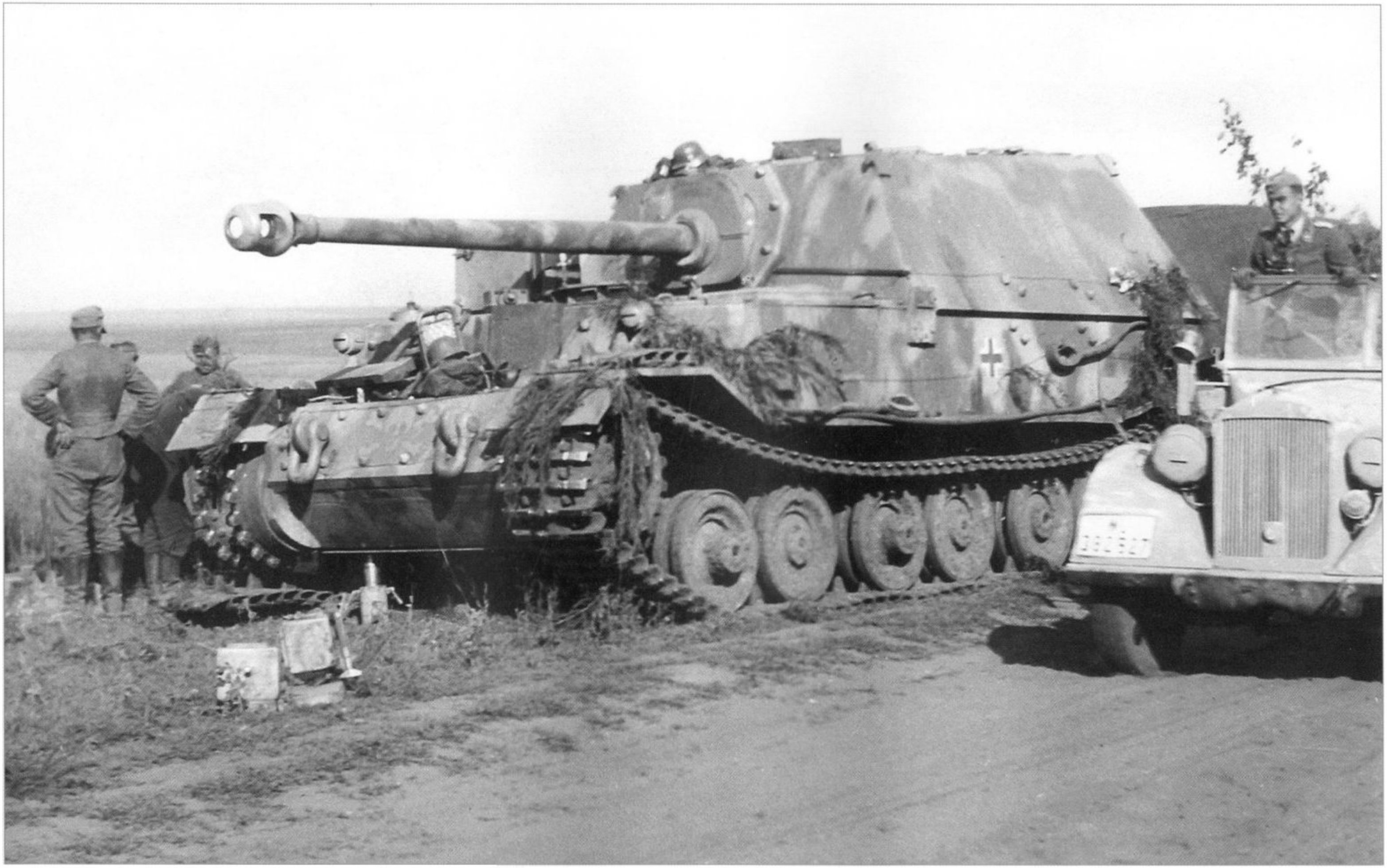
On the same day the Panzeroffizier of the Chef/GenStdH (7 July 1943) noted:

1. *Spare parts supply for Pz.Kpfw. Tiger*
   It turned out that not a total of 22 Tigers became non operational due to transmission failure but mostly due to suspension damage. The 10 transmissions made available in Kassel will be sent by air transport nonetheless. Four are sent to H.Gr. Middle and six are sent to H.Gr. South. Of the two mechanics, only one is sent to H.Gr. South. All 10 planes stop over in Magdeburg and then are filled with spare parts. Even though the delivery of the transmissions is based on a faulty report, it is very welcome because the transmission of the Tiger is very sensitive and an increasing number of damaged transmissions must be expected.
2. *Spare parts for Pz.Kpfw. Panther*
   The ten engines requested by Oberstltn. v. Grundherr for Pz.Kpfw. Panther of H.Gr. South are delivered on 8 July 1943 at four o'clock from Friedrichshafen by air transport. These ten planes as well stop over in Magdeburg and are filled with additional spare parts. The other spare parts for Pz.Kpfw. Panther requested by Oberstltn. v. Grundherr sent by 'Blitzpfeil-Transport' should have left Magdeburg on July 7, 1943 towards 20:48 o'clock.
3. *Tiger maintenance situation with H.Gr. Middle*
   (based on the report of the Panzeroffizier AOK 9, Hptm. v. Karlowitz from 7 July 1943, 22:45 o'clock). Two total losses (engine hits), two commander's cupolas shot off, 14 Tigers undergoing maintenance expected to be operational again by 8 July 1943. Main damage: Three transmission failures (two supposedly operational by 9 July 1943) for the rest suspension damage by mines and shelling (tracks, road wheels, torsion bars).

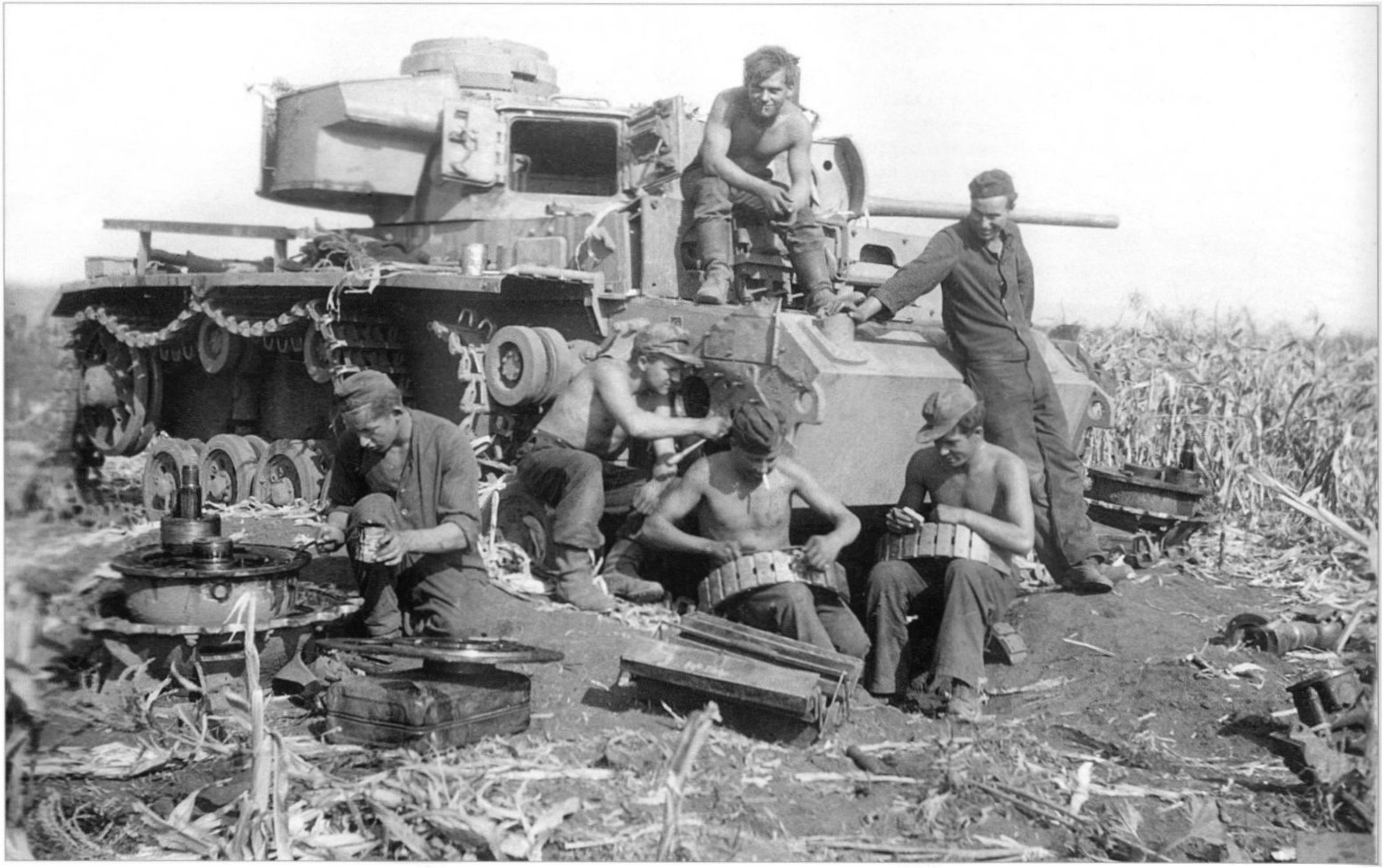
The notes of Gen.Qu./Abt.III/Gruppe V(J)/III from 26 September 1943 about the Panzer engine supply situation said:

The needs for Panther, Tiger and Ferdinand engines could be mostly satisfied with the deliveries to the Panzer spare part depots until 21 September 1943. In the period from 10 - 21 September 1943 alone 70 Panther, 28 Tiger and 34 Ferdinand engines were delivered to H.Gr. South. More Panther engines will only be delivered after the form change ordered by Gen. Insp.d.Pz.Tr.

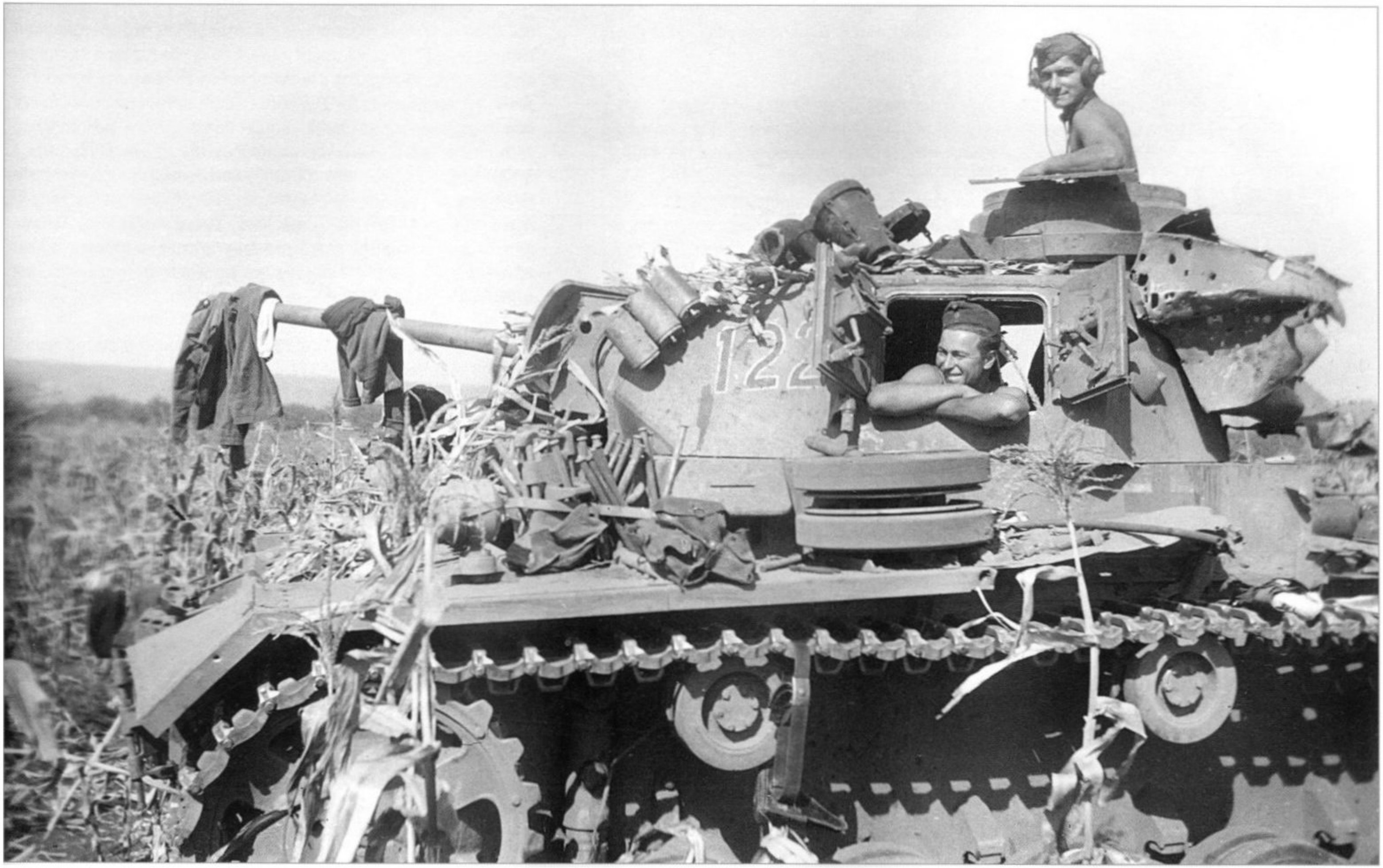
The Panzer spare part depots reported a requirement of 168 Pz.Kpfw.IV and 245 Pz.Kpfw.III/Stu.Gesch. engines by 22 September 1943. From 10 September - 21 September 1943 15 Pz.Kpfw.IV and 25 Pz.Kpfw.III/Stu.Gesch. engines were delivered, 23 Pz.Kpfw.IV and 15 Pz.Kpfw.III/Stu.Gesch. engines are on their way by 'Pfeilstransport'. The H.Wa./WuG 6 promised another 158 Pz.Kpfw.IV and 122 Pz.Kpfw.III/Stu.Gesch. engines from manufacturers and homeland maintenance.



▲ A Ferdinand of s.Pz.Jg.Abt.653 with a large death's head painted on its front. To access the sprocket, various items from the inside had to be removed, such as the radio operator's seat. Hydraulic jacks are lying in front of the vehicle. *AMC*



▲ Mines were a common enemy in the battle of Kursk in the Summer of 1943. Here men are working on the final drive and probably the steering brakes. It seems to make them smile *JH*



▲ A view of a different Pz.Kpfw.III from the opposite page. Notice the many track pins stored on the vehicle, the Bosch headlight, the shredded stowage box behind the turret and the damage to the side fender under and behind the German cross. *JH*

On a visit to H.Gr. South (report dates from 2 December 1943), the Gen.Insp.d.Pz.Tr. Guderian remarked that:

> *... a considerable lack of spare parts is still prevailing. Two thirds of the Panzers available at the Heeresgruppe are lying around due to the lack of spare parts. Urgently needed are engines, spare parts for engines, final drives, transmissions and single parts for steering gears. In the field of Panther engines a certain relief is noticeable for the time being. The momentary maintenance situation is unbearable. Immediate measures to increase the spare part production and reporting about their initiation are requested.*

A note from Organisationabteilung IIIb from 7 October 1943 lists the immediate request of the utmost necessary spare parts:

> ***Pz.Kpfw.III and Sturmgeschütze***
> *100 engines without clutches; 140 engines with clutches; 44 mechanical transmissions; 50 final drives for each side.*
> ***Pz.Kpfw.IV***
> *150 engines HL 120; 50 Planeten-transmissions.*
> ***Pz.Kpfw.V (Panther)***
> *100 engines HL 230 P30; 50 drive trains for each side.*
> ***Tiger***
> *38 engines HL 210 P45; 30 HL 230 P45; 50 Olva-transmissions; 50 final drives; 110 swing arms; 40 idlers; 20 radiators.*
>
> *The most urgent of these requests are regularly sent to the Reichsminister Speer by the Gen.Qu. For the time being a special delegate of Reichsminister Speer has been sent to H.Gr. South, Middle and North to investigate the most urgent requests on scene.*

A presentation note from antitank staff officer at Pz.AOK 8 remarked on the maintenance situation of s.Pz.Abt.503 on 6 October 1943:

> *At 12:10 an alarm company with 8 Tiger is ready in Snamenka. After the receipt of spare parts a further 19 Tigers will be operational within 14 days. 11 Tigers need longer for their repair.*
> *For a fast supply of spare parts, a liaison officer has already been sent to the spare parts depot Magdeburg. As far as it is known only four Tiger Abteilung are deployed on the Eastern front.*
> *Since the spare parts for Tigers are made only in small numbers and thus are not in stock in the Panzer spare parts depot Tschudnow, parts must be loaded in the spare parts depot Magdeburg in such a way that they can be sent by train directly to the units.*
> *A trans-shipment in the spare parts depot Tschudnow results in a delay of 14 days, since too few hoists are present there. Possibilities for the Werkstattzüge to work in Snamenka are sufficient, because a large tent is present.*

On 10 October 1943, s.Pz.Abt.503 reported on the period from 5 July 1943 – 21 September 1943:

> *To replenish and repair 39 Tigers, that all depended on the supply of spare parts, as fast as possible, the Abteilung requested to send one of its spare parts clerks to H.Za. Magdeburg. The OKH was appreciative of this request and allowed to have such a representative of our interests in Magdeburg. After he had left by plane, he could effect the transport of the ordered spare parts with a 'Blitzpfeil-Transport' in wagons solely designated for the Abteilung within just a few days. Thanks to this expedient measure, the repair of the damaged Tigers could be extraordinarily accelerated.*
> *In general, the following can be said about spare part supply:*
> *A fast spare parts delivery and to know immediately which spare parts they can count on short notice [to receive] is close to the troop's heart. The hitherto way of spare part supply requisitioning through the Panzer-Ersatzteillager B usually took 6 weeks, during which no information could be given about the spare parts that could be expected. Like this it is impossible for the troops to plan ahead accordingly.*
>
> *Under the tense situation as is the case with Tiger spare parts, such an interim storage arrangement is an unnecessary delay and obstacle to the supply of parts to the troops. The heavy parts have to be unloaded by cranes from the collective trains,*

> *tediously transported to the Ersatzteillager with the available means and after their partition be loaded again on wagons the same tedious way. Transportation to the troops over 600km by Lkw will soon not be possible at all anymore, especially considering the time of the year. Already the assignment of the Fahrt-No. delays the delivery by several days.*
> *For these reasons, the troops keep insisting that the distribution is done in Magdeburg, that the troops are informed immediately about the percentage delivery and that the spare parts are transported in separate wagons, if possible attached to troop furlough trains or other fast trains, directly to the station closest to the Werkstatt! The work in the Ersatzteillager Magdeburg would be supported by a liaison man of the Tiger-Abteilung. The frequent transports by air would certainly be superfluous.*

The s.Pz.Abt.503 further asked to be supplied with more single parts instead of complete devices, as, for example, the transmission and the final drive, which could be maintained in large part by the troops themselves if they had the requested spare parts. The transport of heavy devices could thus be avoided for most parts.

More excerpts from the activity report of Abt. V of Pz.AOK 4 are given here to show the spare parts and supply reality. The diary continues after the last entry from 21 October 1943 in Chapter Six of RtP1.

22 October 1943
Spare parts:

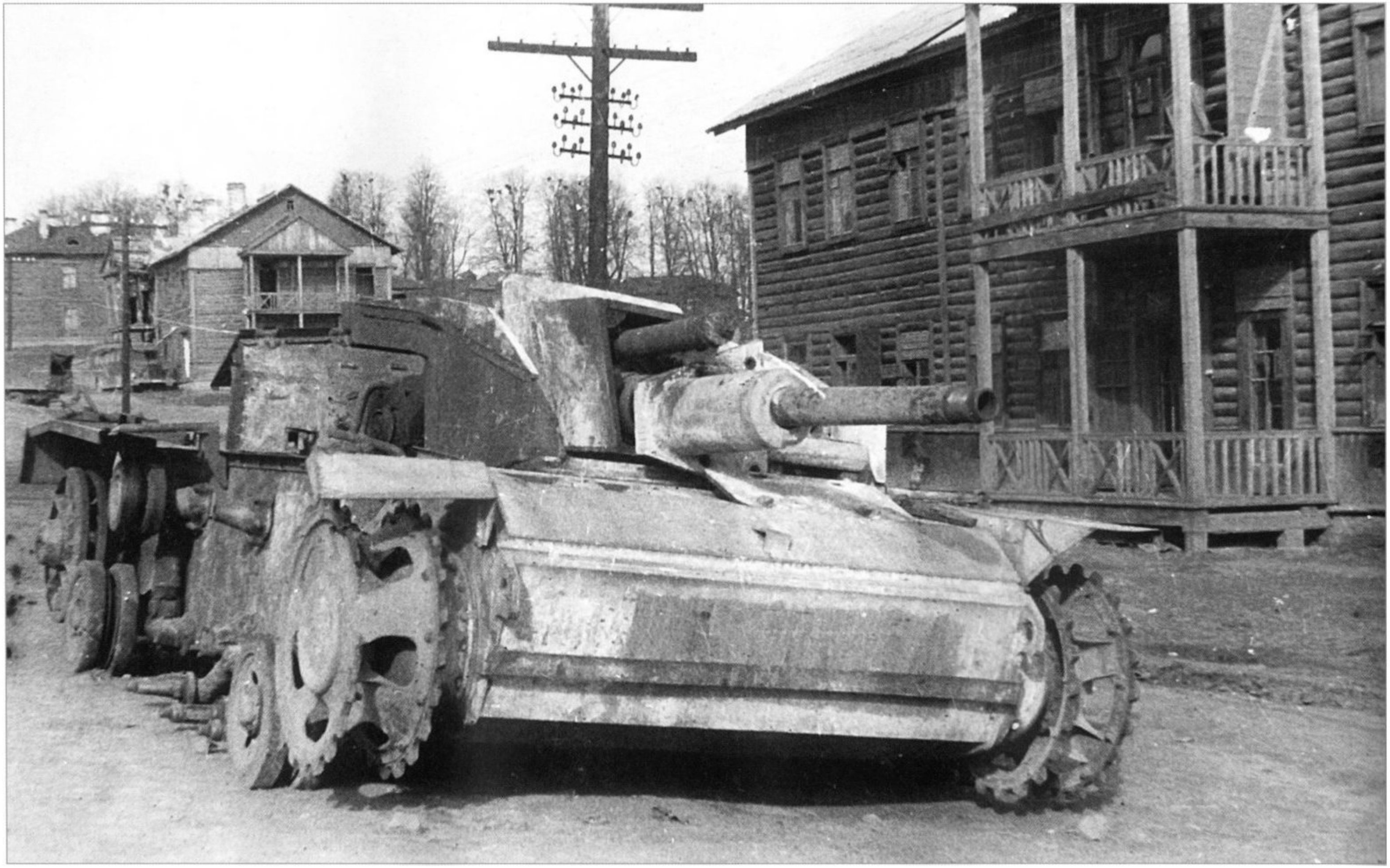
> *H.Gr. South assigns another 160 tires to the Armee to be distributed among the needy infantry divisions. According to the order of Qu.1*
> *Gen.Kdo. VII.A.K. receives 60 tires*
> *Gen.Kdo. XIII.A.K. receives 50 tires*
> *Gen.Kdo. LIX.A.K. receives 50 tires*

13 November 1943
Organization:

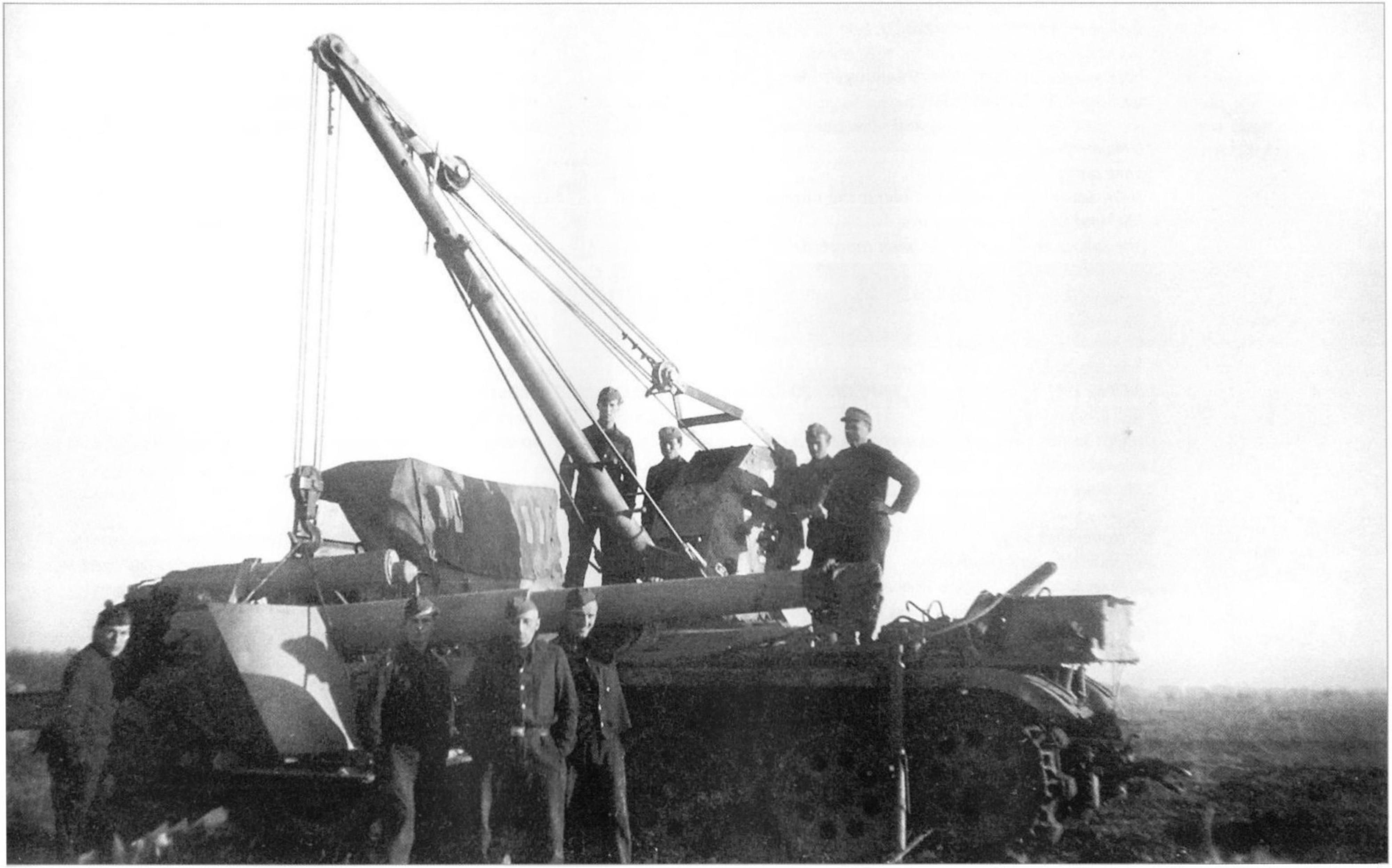
> *H.Gr. South informs that Pz.Inst.Abt.552 shall receive a Schlepp-Panzer (recovery Panzer) chassis Kw.I. It must be picked up at*

▲ A 'schwerer Panzer-Spähwagen' (s.Pz.Späh.Wg.) (Sd.Kfz.231) of the 13.Panzer-Division. The photo is from Willi Kubik, who recorded his memories in 'Erinnerungen eines Panzerschützen 1941-1945.' *WK*

◀ A Tauchpanzer (diving tank) based on a Pz.Kpfw.III (3.7cm) Ausf.G in Robskaja , Russia, Oct 1941. Local women milling about are ignored by the mechanics. *ØL*



▲ A general staff officer of H.Gr. South was quoted in a report from 5 October 1943: "We prefer a Sturmgeschütz over three Panthers." Shown is a StuG III Ausf.G 'convertible' at an unknown location and time. *AMC*



▲ The 15cm gun of a Hummel in Wasilijeska, March 1943. The gun was so heavy that the outriggers were used. In July43, 9.Pz.Armee's verdict on the Hummel was that it had proven itself and was very welcome. Furthermore, it was technically alright. *AMC*

Pz.Inst.-Gruppe North in Riga.

This Kw.I. was still with the Abteilung in March 1944, when it was mentioned again in the diary.

16 November 1943

Spare parts:

H.Gr. South again informed about the urgency of the supply of RSO and Maultier spare parts.

The following arrivals have been reported:

1 Pz.Kpfw.IV for 8.Pz.Div.
2 Mun.-Träger IV for 1.Pz.Div.
41 Sd.Kfz.251 for 1.Pz.Div.
4 Mun.-Träger II for 1.Pz.Div.
1 Sd.Kfz.251/6 for XXIV.Pz.Korps.
24 Pak (Sf.) 4 for 7., 8., and 19.Pz.Div., 20.Pz.Gren.Div., Pz.Jäg. Abt.259 and 616.

H.Gr. South calls and says that 13 Stu.Gesch. engines are available at the airport Kalinowka for SS-Pz.Gren.Div. 'Das Reich'. Message has been forwarded to Gen.Kdo. XXXXVIII.Pz.Korps.

17. November 1943

Organization and spare parts:

Armee Kraftfahr Offizier drove to Biale-Cerkwa with Oberstl. Kulbe of H.Gr. South to discuss the maintenance situation with the newly-arrived Pz-Inst.-Diensten for SS-Pz.Gren.Div. 'LAH', 'Das Reich', 25.Pz.Div. and s.Pz.Abt.509. Examined in particular was why the daily Panzer situation reports show a disproportionately high number of Panzers in long-term maintenance. It turned out that these reports are filed by the Ia, without consulting the workshop companies. Broken-down Panzers are first of all declared as long-term maintenance because the damage could not yet be pinpointed. If the Panzers eventually get to a Werkstatt, it often shows that the damage is only minor. For the future, it must be strived to reconcile the reports with Ia and u.V., which is very difficult to achieve under the current battle situation. General complaints concern engines and transmissions, though it was also discovered that the divisions did not know about the Armee and Heeres maintenance facilities or did not make use of them with the reasoning that they would not get their Panzers back. Oberstl. Kulbe will inform the O.B. of H.Gr. South about the results of these investigations. A supply of Tiger and Panther engines by air transport is planned. 'Gigant' aircraft are already loaded in the Reich but could not take off yet due to the weather.

18. November 1943

Organization:

The 25.Pz.Div. distributed its fully equipped Pz.Wkst.Kp. partially to its other not fully equipped Wkst.Kp. The result is naturally that the capacity of the Pz.Wkst.Kp. decreases. The Ia will be advised that these measures are unsuitable.

SS-Pz.Gren.Div. 'LAH', 'Das Reich' and the 25.Pz.Div. are informed that the Pz.-Bergezug 552 is at their disposal at anytime.

SS-Reich has eight out of its 12 Zgkw.18t undergoing maintenance in Dubno for quite some time but did not try very hard yet to have them finished. The other four vehicles are also at the I-Dienste, so that the division has no recovery means for the time being.

20 November 1943

Spare parts:

2.Fallschirm.Jäg.Div. urgently request Zgkw. engines. They are referred to ZEL 105 since engines are not assigned [by the Armee] yet.

24. November 1943

Spare parts:

The immediate need for Panzer spare parts are:

s.Pz.Abt.509 (Tiger), subordinated to 25.Pz.Div.
    9 engines HL 230, 3 Olwa-transmissions [sic]
25.Pz.Div.
    3 engines for Pz.Kpfw.III
    3 engines for Pz.Kpfw.IV
    3 Variorex-transmissions SSG 77 for Pz.Kpfw.III
    4 final drives for Pz.Kpfw.II and Fg.No.31263-31280
    4 final drives for Pz.Kpfw.IV
SS-Reich
    10 engines for Pz.Kpfw.III
    16 engines for Pz.Kpfw.IV

- *20 engines for Pz.Kpfw.V*
- *4 engines for Pz.Kpfw.VI*
- *1 Variorex-transmission SSG 77*
- *2 transmissions for Pz.Kpfw.IV*
- *7 Olwa-transmissions*
- *4 final drives (right)*
- *4 final drives (left) for Pz.Kpfw.III*
- *12 final drives for Pz.Kpfw.IV*
- *4 final drives (right)*
- *4 final drives (left) for Pz.Kpfw.VI*

7.Pz.Div.

- *6 engines for Pz.Kpfw.III*
- *2 engines for Pz.Kpfw.IV*
- *4 engines for Pz.Kpfw.II*
- *2 transmissions for Pz.Kpfw.III*
- *2 transmissions for Pz.Kpfw.IV*
- *2 final drives for Pz.Kpfw.IV (H)*

19.Pz.Div.

- *5 engines for Pz.Kpfw.III*
- *8 engines for Pz.Kpfw.IV*
- *1 engine for Pz.Kpfw.38(t)*
- *1 transmission for Pz.Kpfw.III*
- *2 transmissions for Pz.Kpfw.IV*
- *4 final drives (right)*
- *4 final drives (left) for Pz.Kpfw.IV*

SS-LAH reports provisionally

- *30 engines for Pz.Kpfw.V*
- *6 engines for Pz.Kpfw.VI*

1.Pz.Div.

- *Engines: 11 EM, 15 FM, 1 HM, 4 DG, 4 EG*
- *Transmissions and final drives: 2 TS right, 1 CS [sic] left, 4 ES right, 3 ES left, 2 FS right, 3 FS left.*

8.Pz.Div.

- *Engines: 4 CM, 7 BM, 5 EM, 5 HM, 3 HG, 2 ES*

27 November 1943

Spare parts:

The capacities of ZEL 105 are currently very low. Two recently arrived trains with spare parts had only a minor impact on its stock. For example only 22 bins of battery acid with 50 liters each have arrived for the Armee. But SS-Reich alone requested 26. The distribution is: only 1 bin for each Pz.Gren.Div. and Pz.Div., two bins for all other army or supply units. The Armee's need for batteries is 2,454, assigned were only 80, which equals 3%.

▼ Undated appendix of Gruppe V(J) about the Panzer engine supply situation in the second half of 1943.

Status	Pz.Kpfw.III & StuG		Pz.Kpfw.IV		Pz.Kpfw.V		Pz.Kpfw.VI		Total unmet requests
	In stock	Unmet requests	In stock	Unmet requests	In stock	Unmet requests	In stock	Unmet requests	
Eastern Front total									
1. July	213	...	186	...	...	...	...	...	...
1. Aug.	119	14	79	14	5	...	7	9	37
1. Sept.	68	27	77	30	1	23	12	22	102
1. Oct.	15	214	7	89	11	29	3	18	350
20. Nov. [sic]	8	342	10	178	...	33	1	36	589
1. Nov.	15	269	4	152	9	35	...	32	488
1. Dec.	6	278	5	142	6	20	...	26	466
10. Dec.	9	187	7	159	7	24	17	24	394
19. Dec.	10	296	6	139	4	70	2	51	556
28. Dec.	...	170	...	110	...	53	...	28	361
Heeresgruppe South and A									
1. July	84	...	70	...	...	...	...	...	...
1. Aug.	31	10	11	12	5	...	5	2	24
1. Sept.	2	27	...	30	1	23	10	13	93
1. Oct.	3	210	1	82	11	29	...	14	335
20. Nov. [sic]	...	311	...	155	...	33	...	32	531
1. Nov.	...	231	...	128	9	35	...	32	426
1. Dec.	4	251	...	135	6	20	...	26	432
20. Dec.	3	154	7	149	6	24	14	21	348
28. Dec.	...	135	...	95	...	33	...	25	308

1944: The Long Retreat

In 1944, the evacuation of maintenance facilities, vehicles, equipment and everything else that was once brought along kept on going. Some more examples are given from the activity report of Pz. AOK 4, Abt. V.

Larger numbers of damaged vehicles needed to be evacuated:

5 January 1944

> *There are 280 damaged vehicles to be evacuated from Saslawl (Pz.Kpfw.W.Kp.924) and 400 from Staro-Konstatinow (19. Panzerdivision).*

The evacuation was difficult because no rail wagons were available.

8 January 1944

Recovery:

> *Oberstlt. Dr. Ing. Müller, XXXXVIII.Pz.Korps, is pointing out the extremely serious situation of recovery means for Panzers. The situation is widely known. Requests are useless.*

11 January 1944

Losses investigated:

> *Major Doesch, H.Gr., wants to know if the 51 Panzer losses of L.SS.A.H. were caused by enemy fire or technical failures.*

Five days later, L.SS.A.H. reported their Panzer losses: 1 Pz.Kpfw. II, 35 Pz.Kpfw.IV, 25 Pz.Kpfw.V, 6 Pz.Kpfw.VI, 12 Stu.Gesch., 1 Haub. and 2 Sfl., 75% lost due to shelling, rest lost due to technical failures.

13 January 1944

Recovery:

> *In Zaslaw all damaged vehicles of Inst.Kp.108 evacuated. Some vehicles from AKP 538 seem to be still there. KP(Ost)635 received a train with 40 wagons at the last minute. Damaged vehicles presumably evacuated.*

Despite the efforts everywhere to evacuate the German equipment, the interest in operational T-34 was still high. Here is one example of many:

17 January 1944

> *4.Gebirgs-Division reports: two T-34s by Jersienky, 40km east of Winniza, not yet recovered. XXXXVI.Pz.Korps answers: The I-Staffel of 16.Panzerdivision has been working on the T-34s for two days and could not put them back into running condition. Pz.-Bergezug 552 is ordered to recover the Panzers to Winniza. Later it is reported that this is not possible because the area can be observed by the enemy. Two Zgkw. were damaged while trying.*

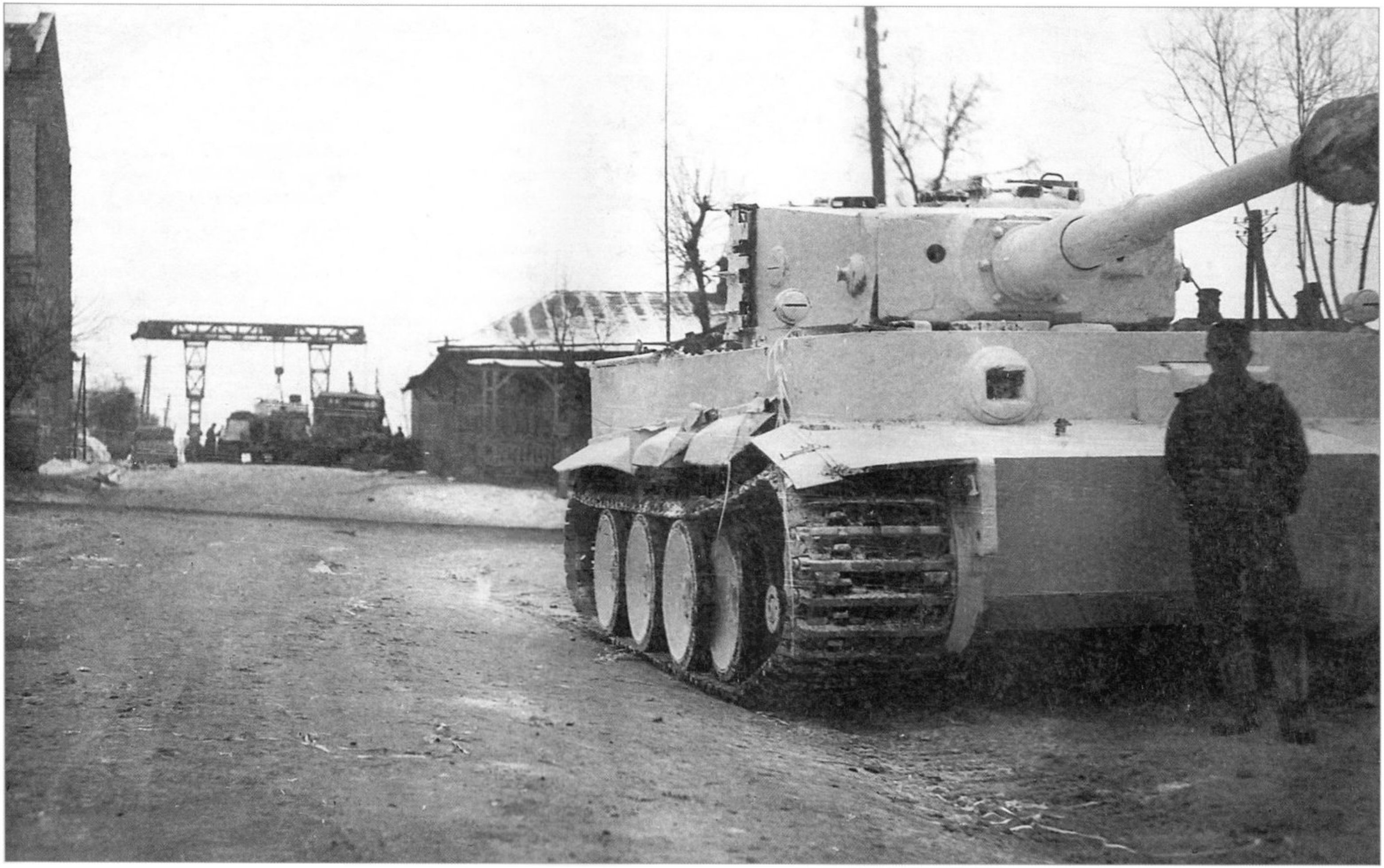
Sometimes it could take a while until the Panzers reached their destination. Unfortunately we do not know why five Tigers seem to have been forgotten in a small Ukrainian town.

> *Transport leader of Pz.K.745 is reporting with five Pz.Kpfw.VI for SS-Reich. He stands in the station of Zloczow since 1 January 1944.*

The following diary entries from 12 and 13 February 1944 however give the impression that Zloczow just meant no luck for Tigers:

> *Bv.T.O. reports that six Tigers have rolled through Zloczow by mistake. They will be rolled back.*
> *Hptm. Schneider, Abt.V, is checking the changing of tracks on Pz.Kpfw.VI in Zloczow. Since 30 December 1943 eight damaged Pz.Kpfw.VI have been waiting on train wagons that cannot be transported further because of troubles with track changing.*

Later it was noted that 150 nuts and screws [sic] for track changing were missing. Because such nuts and screws were not in stock at the Panzer-Ersatzteillager, it had then been effected that the nuts were taken from other damaged Tigers that were lying around in the station as well. The s.Wkst.Kp.917 was providing five men with tools to dismount the screws. Because this was already the second case that these screws were missing, sabotage was assumed.



▲ Tigers of s.Pz.Abt.506 in the winter 1943/44. A 16to Strabokran is erected in the inner working position that only allowed space for one Tiger. The paint job looks rather fresh, especially when considering that the side fenders have taken some blows. *JH*

While normally Panzers were sent on special trains to a station near the frontline, the 2.SS-Panzerdivision was ordered to pick up their Panthers back in Magdeburg. As so often, no reason is given for that entry:

1 February 1944

SS-Reich gets 10 Pz.Kpfw.V allocated. Take-over ordered in Magdeburg.

The Heeresgruppe reported the following losses from December 1943 until 5 January 1944:

6 February 1944

963 motorcycles,
1,156 Pkw,
1,840 Lkw,
31 Kom,
7 RSO,
46 Maultier,
40 Kr.Kw.,
256 Zgkw.
88 trailers.

7 February 1944
Spare parts:

Spare parts such as engines, ball bearings and transmissions have been offered to all Panzer units by telex.

17 February 1944
Spare parts:

SS-Reich informs that four Wespe are not operational due to the lack of spare parts. Consultation of the Panzer-Ersatzteillager shows that 1.) no request is on hand, 2.) all spare parts are in stock.

18 February 1944
Spare parts and supply:

It was noticed that the H.Gr. assigned five Volkswagen to Gen. Kdo. XXXXVIII.Pz.Korps without telling the Armee. It is remarked that assignments are only done through the Armee.

19 February 1944
Organization:

The accommodation of s.Wkst.Kp.917 in Drohobicz and the Kfz.-Inst.Kp.162 in Sjelkow is not definite yet. It cannot be clarified before Monday, February 21, 1944, because the authorities in Krakau do not work from Saturday noon until Monday morning.

Spare parts:

As it has already been said after their inspection, the conditions of Stu.Gesch.Abt.276 and 280 are not as bad as it seemed after their report. Spare parts for almost all damaged Panzers are either in stock with the Abteilungen or with the Panzer-Ersatzteillager. Stu.Gesch.Abt.276 has handed over five Panzers to the Panzer maintenance units of the Armee. The Instandsetzungs-Züge of both Abteilungen are well equipped. Repair work at Stu.Gesch. Abt.276 is not vigorous enough. The Kriegs-Ing. has no great experience with Sturmgeschütze, the Werkmeister is ill. A strong leadership is missing. The Instandsetzungs-Zug of Stu.Gesch. Abt.280 is OK.

20 February 1944
Spare parts:

Pz.Abt.118 is asking for spare parts supply. It is established that the Panzer-Ersatzteillager in Zloczow can provide most of the requested parts.

Recovery:

BBv. Lemberg reports that the Panzers which have been laying in the station of Zloczow for weeks can be evacuated. The way is secure.

Hptm. Schneider, Abt.V, examines the damaged Pz.Kpfw. VI in the Zloczow station. They are in very bad condition. The hatches are open, snow is in the fighting compartment, 'Blinkteile'[signal pieces] have rusted, also damage by force was detected. The unloading officer ('Ausladekommissar') was informed and proposed to interrogate transport attendants. The 'Ausladekommissar' said in the evening that the damage was *already done when the Panzers arrived in Zloczow. Among other things, the radios were missing. The installations are destroyed. Kfz.-Inst.Abt.570 provides 20 men to change the tracks of six Tigers.*

23 February 1944
Recovery:

Zloczow station reports four damaged Pz.Kpfw.VI departed, the remaining four will follow 23 February 1944.

These must be the eight damaged Tigers that have been waiting on train wagon since 30 December of last year due to track changing problems.

24 February 1944
Organization:

Inst.Kp.168 has around 40 damaged Kfz. in work, that have all been assigned by Inst.Abt.570.
AKP 538 receives the order to overtake the unfinished damaged Kfz. of Inst.Kp.194.

25 February 1944
Spare parts:

Pz.Wkst.Kp.924 receives a 16to Portalkran. It has to be picked up at the Panzer-Ersatzteillager Zloczow.
SS-Reich receives two sets of tracks for Zgkw.18t from Gleiskettenlager Golta.

29 February 1944
Organization:

Oberstlt. Bastian calls: For some time now a rail car has stood in Krasne near Lemberg. Attendant is Gefr. Josef Bloching, Stu. Gesch.Abt.277. The wagon carries two damaged engines, Panzer winter equipment and old material. The wagon has been traveling from one place to the next for quite some time. By telex the wagon is ordered to Panzer-Instandsetzungs-Gruppe South in Sanok and the Gefreite to return to his unit.

1 March 1944
Spare parts:

It has been found out that the troops declare several spare parts as not available without requesting them at the Panzer-Ersatzteillager.

3 March 1944
Spare parts:

Ersatzteilstaffel 406 has been ordered to only hand out spare parts in exchange for old ones since the commitment notes [to return items] ('Verpflichtungsschein') are very often not honored.

A shortage of towing and recovery vehicles not only affected Panzer recovery, but also led to the loss of guns:

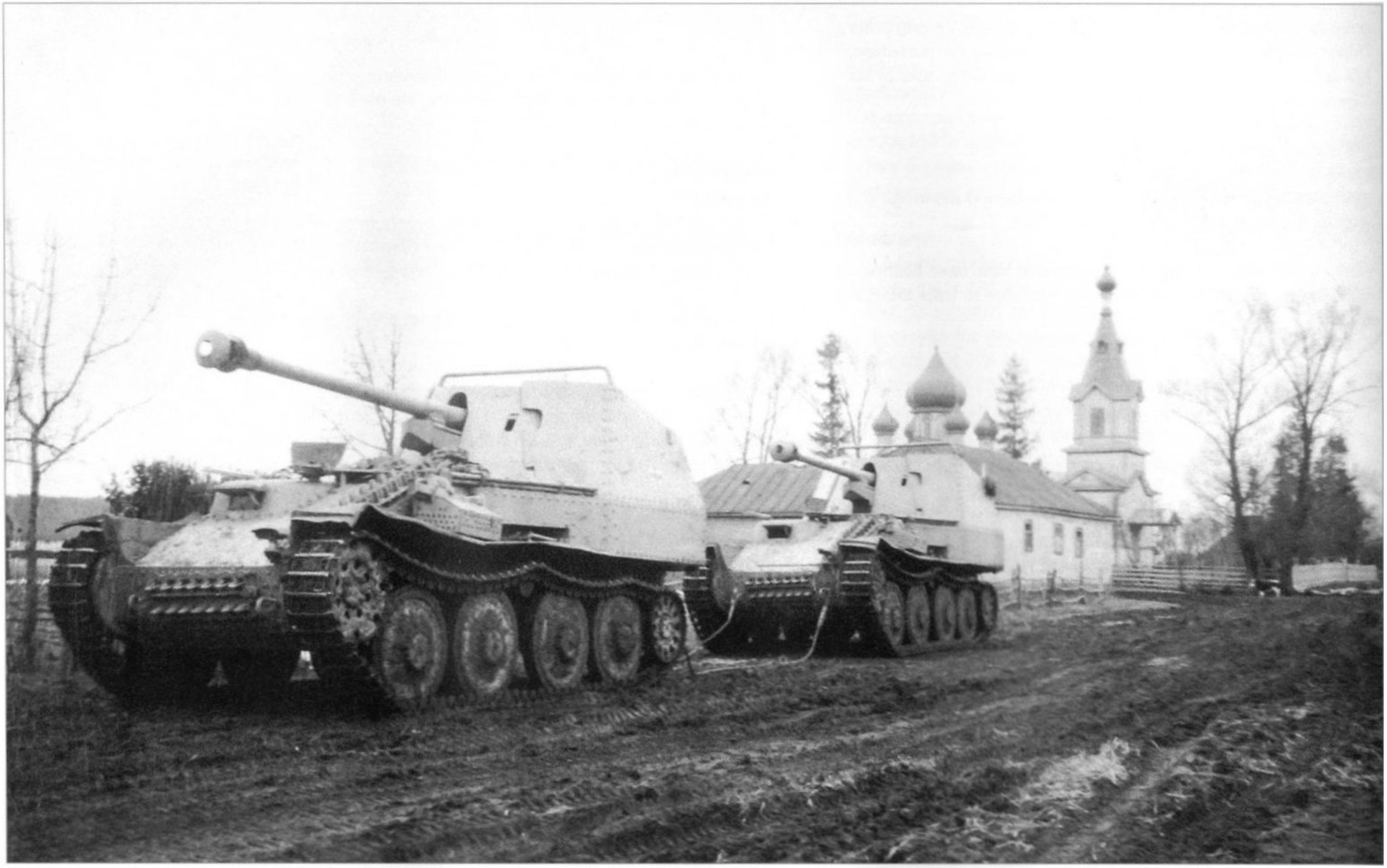
Qu.1 informes that due to the lack of towing vehicles 17 le.F.H., nine s.F.H., four 10cm Kanone, 12 8.8cm Flak, 24 2cm Flak, seven 15cm Nebelwerfer, eight 21cm Nebelwerfer, 12 7.5cm Pak and eight 10.5cm Pak [sic] *from SS-LAH cannot be towed.*

Because of the tactical situation, the Pz.-E.-Lager B and the GKMot.-Werk M needed to make itself ready to be evacuated. For the time being all trains were directed to the Pz.Inst.Gruppe South which already had moved to Sanok and new spare part trains were no longer sent to Zloczow.

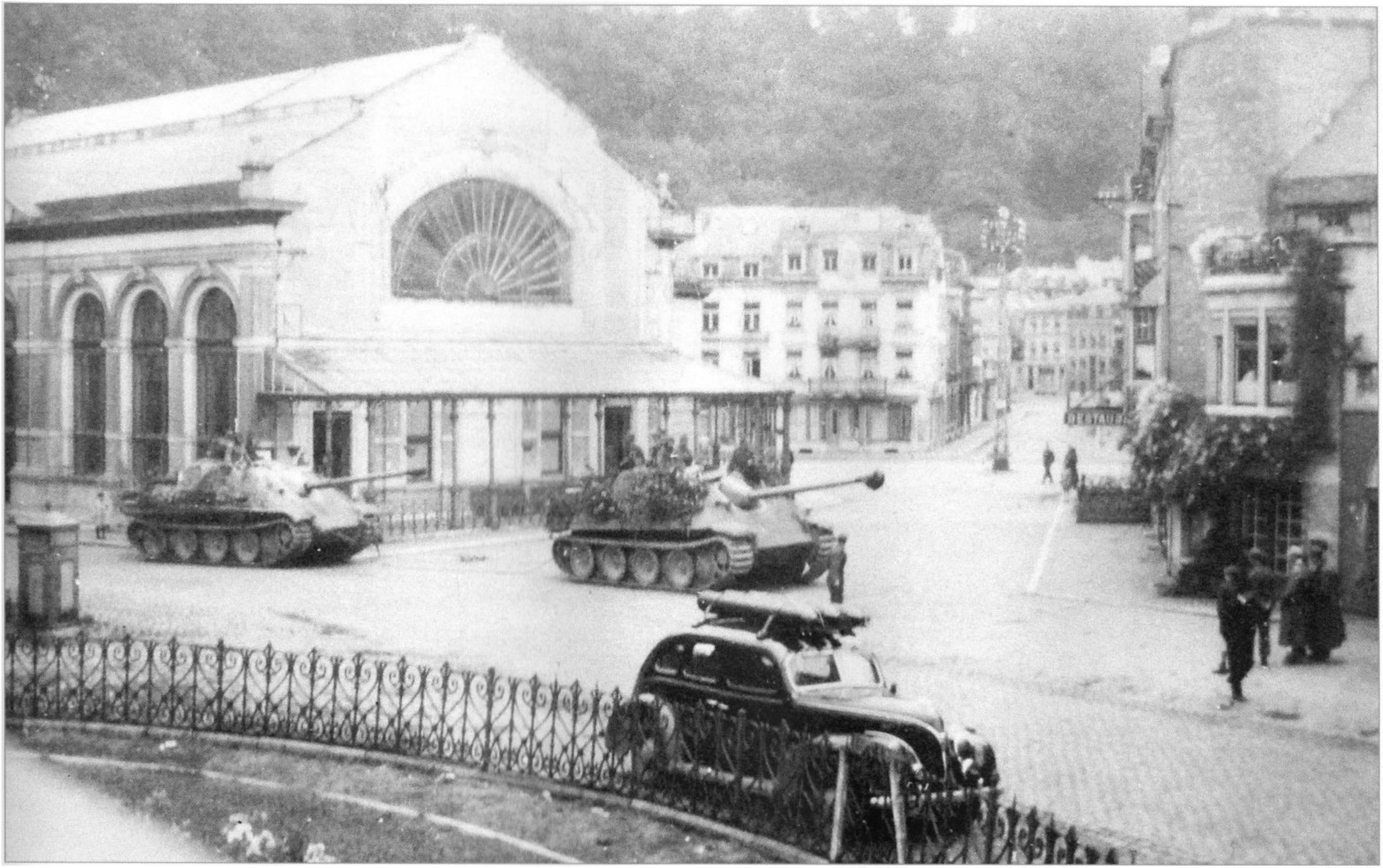
6 March 1944

At the moment, Pz.-E.-Lager B contains approximately 2,500to of spare parts, thereof 1,000to Panzer winter equipment. It is proposed to send the Panzer winter equipment to Warschau as it is not needed anymore. The evacuation will be difficult because right now it seems impossible to get any rail cars.
K.P.O.539 in Tarnopol has received the order to move with its 900 damaged Kfz. It needs 13 trains each with 40 cars.

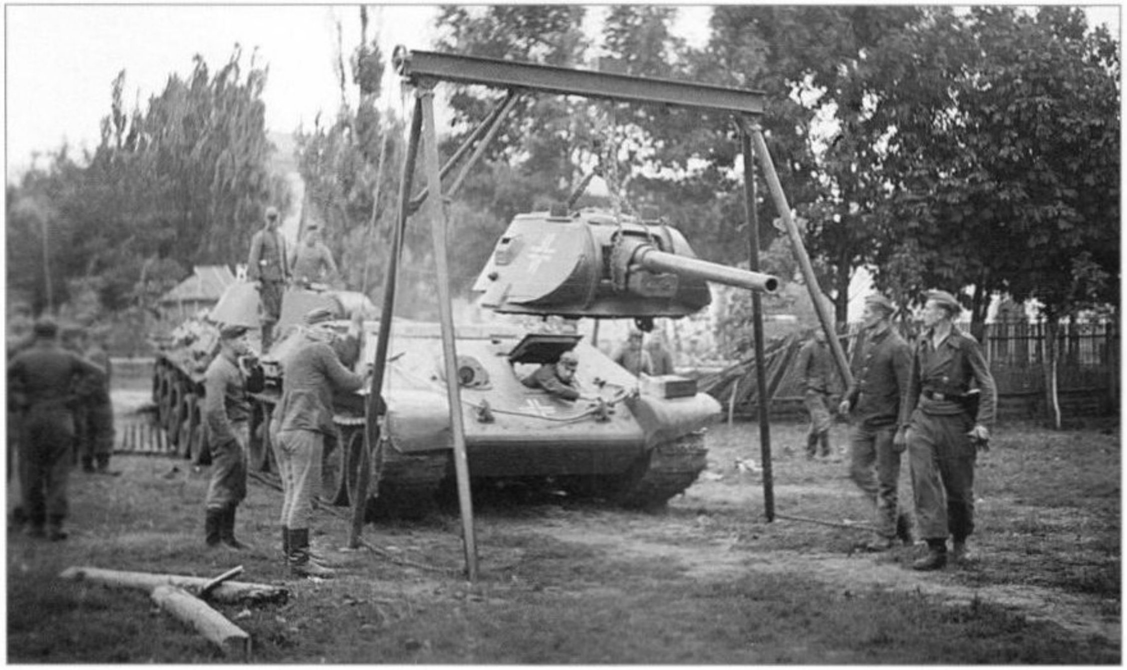
Two days later, H.Gr. South disagreed with the evacuation. Only the GKMot.Werk M3 was ordered to move to Sanok, the spare parts depot was supposed to stay in Zloczow. Further care through the Armee was declined.



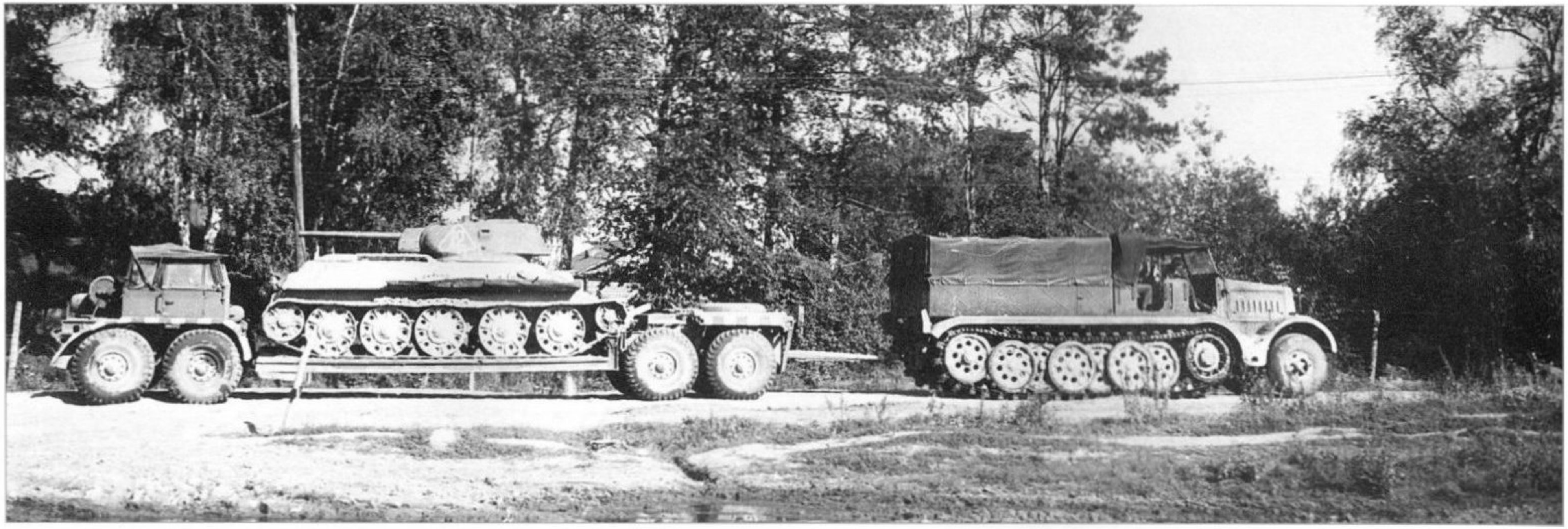
▲ A 7,5cm Pak 40/3 auf Sfl.38 (Ausf.M) with considerable track sag is pulling another of its kind. To deploy these tank hunters successfully, they had to be understood as an anti-tank gun on tracks, not as a fully armored assault gun. *AMC*



▲ Two Jagdpanthers of s.Pzj.Abt.654, one towing the other, move through Spa, Belgium in September 1944 on their way back to Germany. Is the civilian car with gas bottles on the roof part of the I-Gruppe? *AMC*



Despite the large numbers of T-34s deployed by the Russians, not many were captured in a state that left them useful for the Germans (see above). The T-34s on the left belonged to 3./StuG.Abt.197, photographed in Poltava, Oct41. *JH, AMC, MHP*



12 March 1944

Recovery:

In Zloczow a Pak with ammunition has been standing on the street for days. Feldgendarmerie has been informed, ammunition removed, Pak is being towed. Pak belongs to 7.Panzerdivision who have been informed.

Different rewards were granted for Russian tanks. Here is a typical example:

15 March 1944

340.Infanteriedivision is asking for four Maultier-Lkw and s.Pak as reward for recovering two T-34s. Four RSO are assigned by the O.K.H.

20 March 1944

Organization:

Stu.Gesch.Brig.332 reports that 'Kampfkommandant Brody' is using the Brigade's Wkst. as infantry. O.Qu. informed. Release effected.

Of course it was not the idea to use Wkst. personnel as infantry. But it was still better than being overrun without a struggle.
East of Brody, over 100 Lkw were still waiting to be evacuated. The Gen.Kdo. XIII.Armee Korps requested towing vehicles.

Spare parts:

Panzer-Ersatzteillager asked to supply urgently needed engines, drive trains, etc., by air transport. Denied, because the Panzer-Ersatzteillager is dismantling. Nothing is sent to Zloczow anymore.

21 March 1944

Kfz.Inst.Abt.570 reports eight Hiwis have escaped.

29 March 1944

Because the road Brody – Zloczow is occupied by the enemy for the time being, a higher number of Pz.Kpfw.V are lying around and cannot be evacuated to the Wkst.

30 March 1944

Spare parts:

H.Gr. South makes 29 Panzers (IV, V, VI, Pak, Wespe and Hummel), finished by Panzer-Instandsetzungs-Gruppe South, Sanok, available to the Armee.
ZEL 105 leaves an advanced issuing office with approximately 1,000to spare parts in Lemberg. The final location of the ZEL is not known yet.

1 April 1944

Spare parts:

'Kampfkommandant Tarnopol' is requesting Panzer spare parts by radio. They will be picked up in Lemberg or Radymno and made ready for air-drop. The request can be fulfilled 100%. The spare parts are transported to the air supply base here.

9 April 1944

The five Hummel sent to Bielefeld by mistake are ordered back.

12 April 1944

Organization:

Different K-Werke in Radom are visited, especially Auto-Union. The Werk is very well equipped with spare parts and can give away spare parts to the I-Dienste of the Armee. The Park and the connected ten K.-Werke are able to perform difficult Kfz. maintenance, with the result that in most cases it is not necessary to evacuate the damaged vehicles to the homeland.

18 April 1944

Spare parts:

Stu.Gesch.Brig.322: Panzer spare part supply is very good.
357.Infanteriedivision reports sabotage on French tires. After just a short time over 100 Michelin tires of Renault vehicles got punctured so badly that they turned completely useless. It turned out that the tires had cross cuts on the inside done by sharp knives.
Heeresgruppe is asking for a 6.5to Studebaker to show the Führer. They have been told that the Armee has only a 3to Studebaker in its territory. Apparently the weight must have been confused.

Nothing is known about a 6.5to Studebaker.

20 April 1944

The Studebaker of the Gen.Kdo. XXXXVIII.Pz.Korps is being presented. After a test drive and a cleaning the truck is sent to the H.Gr. in Lemberg with a driver and a co-driver. As replacement for the Studebaker a s.Maultier-Lkw. is offered.

21 April 1944

Spare parts:

The Panzer maintenance as well as the spare parts situation is considered as good. Only Panzer recovery means are short, so that the evacuation of Panzers to Pz.Wkst.Kp. is difficult.

Five final drives taken over at the Lemberg airport and handed over to 10.SS-Panzerdivision.

22 April 1944

Spare parts:

61 repaired engines have not been picked up by their units despite their being informed.

23 April 1944

Panzer-Instandsetzungs-Gruppe South is set up very well and can accept at least 150 damaged Panzers. At the moment it has only around 50 Panzers though.

3 June 1944

The following Panzers are assigned: Eight Pak (Sf) 38(t) to 1.Panzerdivision, 16 Pz.Kpfw.V for 1.Panzerdivision, eight Pak (Sf) 38(t) for 8.Panzerdivision, 20 Stu.Gesch. for Stu.Gesch. Brig.249, one le.Späh.Wg. for 8.Panzerdivision, one Berge-Pz.V for s.Pz.Abt.507, one Berge-Pz.V for I./Pz.Rgt.11, one Berge-Pz.V for Stu.Gesch.Brig.322.

Providing NS-schooling for maintenance units was an issue on higher command levels. The results however seem not to have been too satisfying:

17 June 1944

Pz.A.Kf.Offz. visited the Kfz.Inst.Park 635 and attended the service. Nationalsocialist class by Hptm. Kauer. Topic and explanation were too difficult for the understanding of the simple soldier.

18 June 1944

Organization:

Pz.A.Kf.Offz. inspects the Vulkanisierungs-Werke in Radom. Besides Auto-Union and Bosch there are only small workshops that are barely useful for larger repairs. However, in Radom is the generously equipped Steyr-Werk, which is still subordinated to Kfz.Inst.Park 622 that is not in Random anymore. It shall be attempted to subordinate the Steyr-Werk to the Kfz.Inst.Park 635.

Steyr used up to 2,900 forced laborers from the concentration camp KZ Majdanek who had to live there in a camp led by a SS-Obersturmführer. The camp was evacuated on 29 July 1944. All but 200 people died on the death march.

The 5.Panzerdivision gets 40 free spaces at the Kfz.Inst.Park 537 assigned for Opel-Kadett.

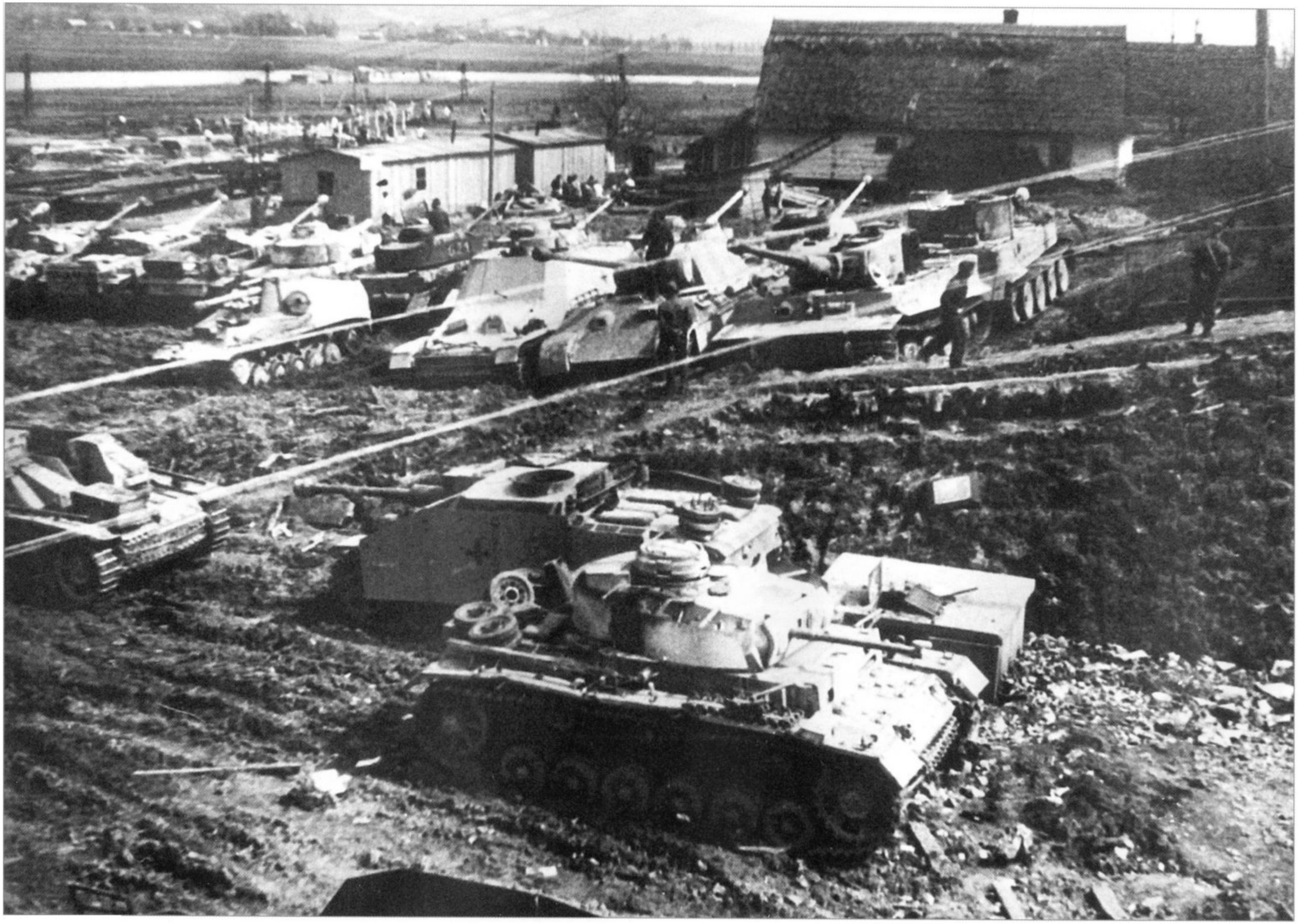
23 June 1944

Spare parts:

Pz.Inst.Abt.543 is dismounting T-34 spare parts for Ski-Jäg. Brig. 1 in Radziechow. These parts were ready five days later in Kamionka.

With the end of the diary of Pz.AOK 4 in June 1944 the curtain falls back down over this long neglected area. Thanks to what we have learned from the previous year though, we can picture how it continues behind the curtain for the last ten months of the war.

▶ The large array of different vehicles point towards a K-Werk, or at least a collection point for broken down vehicles, from where they were further evacuated by the Army or HGr. In the front is a Panzerbeobachtungswagen III based on a refurbished Pz.Kpfw. III Ausf. F. The Tigers suggest that the photo was taken in spring of 1944. *AMC*



A report from s.H.Pz.Jäg.Abt.563 from 21 March 1944 describes their spare parts situation as follows:

> *Due to the severe lack of spare parts, especially tracks for Zgkw.8t since November 1943, eight guns are immovable. It was difficult for the Abteilung to tow these guns in a shuttle service during the sudden, totally rushed disengagements. After the abrupt onset of snowstorms and a new mud period the towing vehicles that were under way day and night kept failing due to transmission and track damage. Because of this, seven guns had to be blown-up. Since November 1943 the Abteilung constantly kept asking for 8to tracks. It was not possible to get tracks through either Pz.AOK 1 or AOK 6. As soon as the Abteilung was assigned under the command of AOK 8, five sets of tracks could be picked up in Birsula. AOK 8 also sent a message saying that any number of tracks could be picked up in Golta even without assignment. The Abteilung immediately sent its best two vehicles to get the tracks. Until today those vehicles have not reappeared. It must be assumed that they were retained in Wossnesensk for other duties without notifying the troops. Due to that, five Zgkw.8t were lost and had to be blown-up. Three more Zgkw.8t fell into enemy hands. The Abteilung does not understand how these tracks were unavailable for so long and suddenly with the AOK 8 they were. The quality of the vehicles, especially the transmission, differential and the tracks of the Zgkw.8t, do not meet the requirements. The spare part supply in this field has failed since Fall last year. Consequently the Abteilung had to blow-up 25 Maultiere, 18 Zgkw. and a large number of wheeled vehicles.*

Experience report Pz.Aufkl.Abt.23 from 8 May 1944:

> *The loss of the many armored vehicles that bogged down in the mud - often with only minor damages - was quite large and only the result of the lack of spare parts. The newly formed 5th (heavy) company did not get any spare parts on the way. The 3rd company does not have any spare parts either. When I took charge over the Abteilung in January I immediately pointed out the situation and requested the needed parts. Only two days ago on 6 May 1944 did the first spare parts arrive.*
>
> *Deployment: Very special attention must be paid to the assignments of spare parts. It is totally untrue that one is told in the homeland "spare parts need to be obtained by the field troops, they are available in sufficient numbers." This information does not represent the truth. After the return to the East the company did not find spare parts with the Abteilung or the division.*

Another unit that also did not have an initial stock of spare parts was the Pz.Brig.113 (as noted by 'General der Panzertruppe West' on 16 or 19 September 1944).

Contrary to the above, units were normally sent on their way with an initial stock of spare parts. Prisoner of war Feldwebel Plätz of s.Pz.Jäg.Abt.654 describes that initial stock after his capture on 26 April 1945 in Bremen:

> *... The Abteilung received a first stock of spare parts, which included among others four engines, six final drives, 30 inner and 30 outer brake drums, two sprockets and two road wheels, two sets of tracks, ten torsion bars, three self starters, 23 lighting generators, numerous small parts but no transmissions. The supply of spare part lay in the hands of the 'Ersatzteilgruppe'. It established contact with the advance spare parts depot of the 'Panzerstützpunkte'. Requisitions were checked here and supplies would often come from stock. If the part requested was not in stock, requisitions were passed on through usual channels. As the normal procedure for obtaining back ordered parts was too slow, individual units very often acted on their own initiative and went straight to the OKH Panzer spare parts depot ... [or] the producer.*
>
> *The parts which were most difficult to obtain were: Final drive, tk engines, Gearbox AK7-200, Ballbearing WUL 110 and SKF No. 22220.*

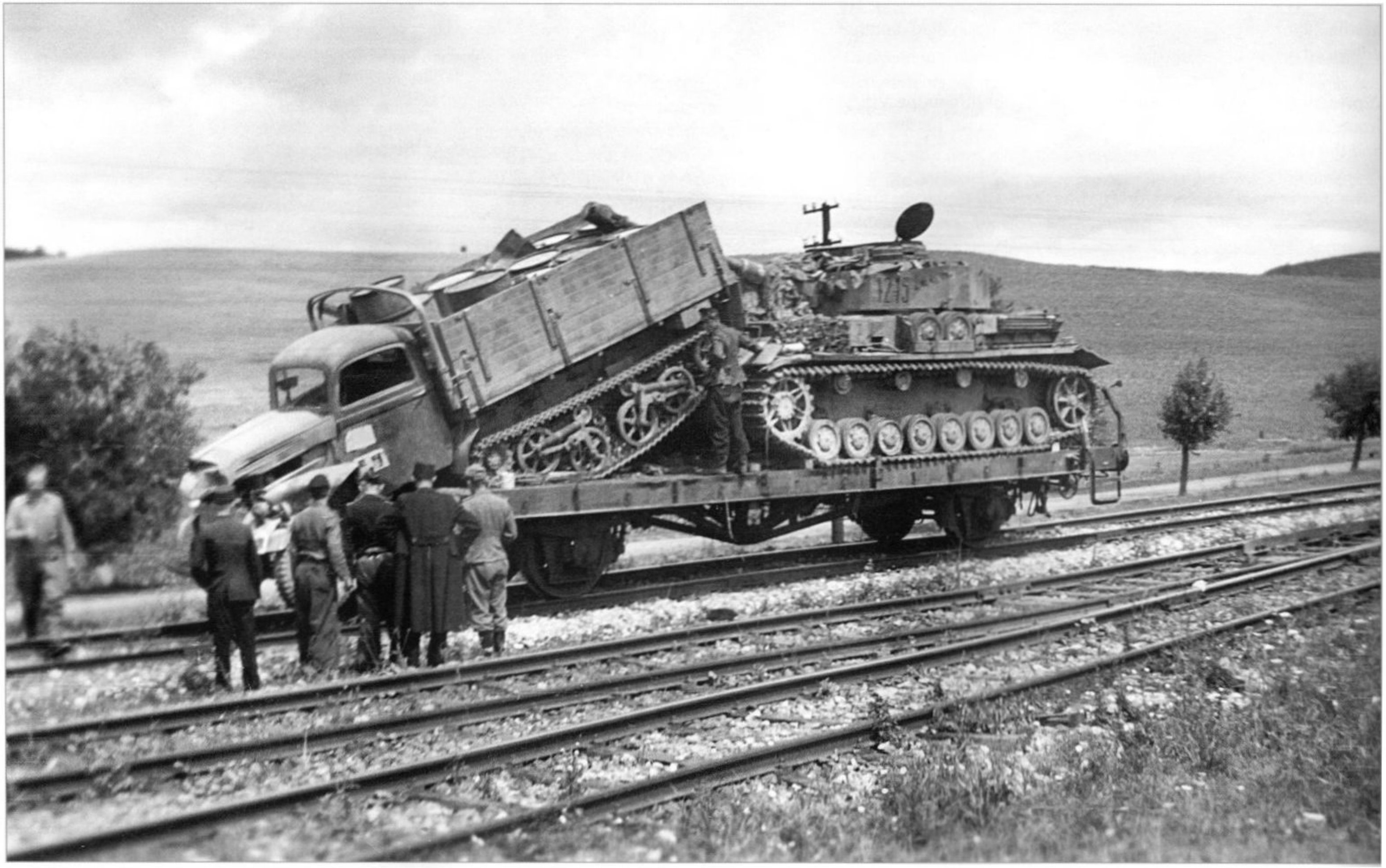
According to Fdw. Plätz, there was an OKH Panzer-Ersatzteillager A in Posen, B in southern Silesia, C in East Prussia, D in Wiesbaden and a depot E and F. The spare-part depot D had an advanced depot at the 'Panzerstützpunkt West' which then again had another advanced depot of unknown location.

A presentation notice of Gen.d.H./Gen.Qu./Abt.III/Gruppe V(J)/III from 29 May 1944 depicts the Panzer maintenance performance and the Panzer spare parts situation as follows:

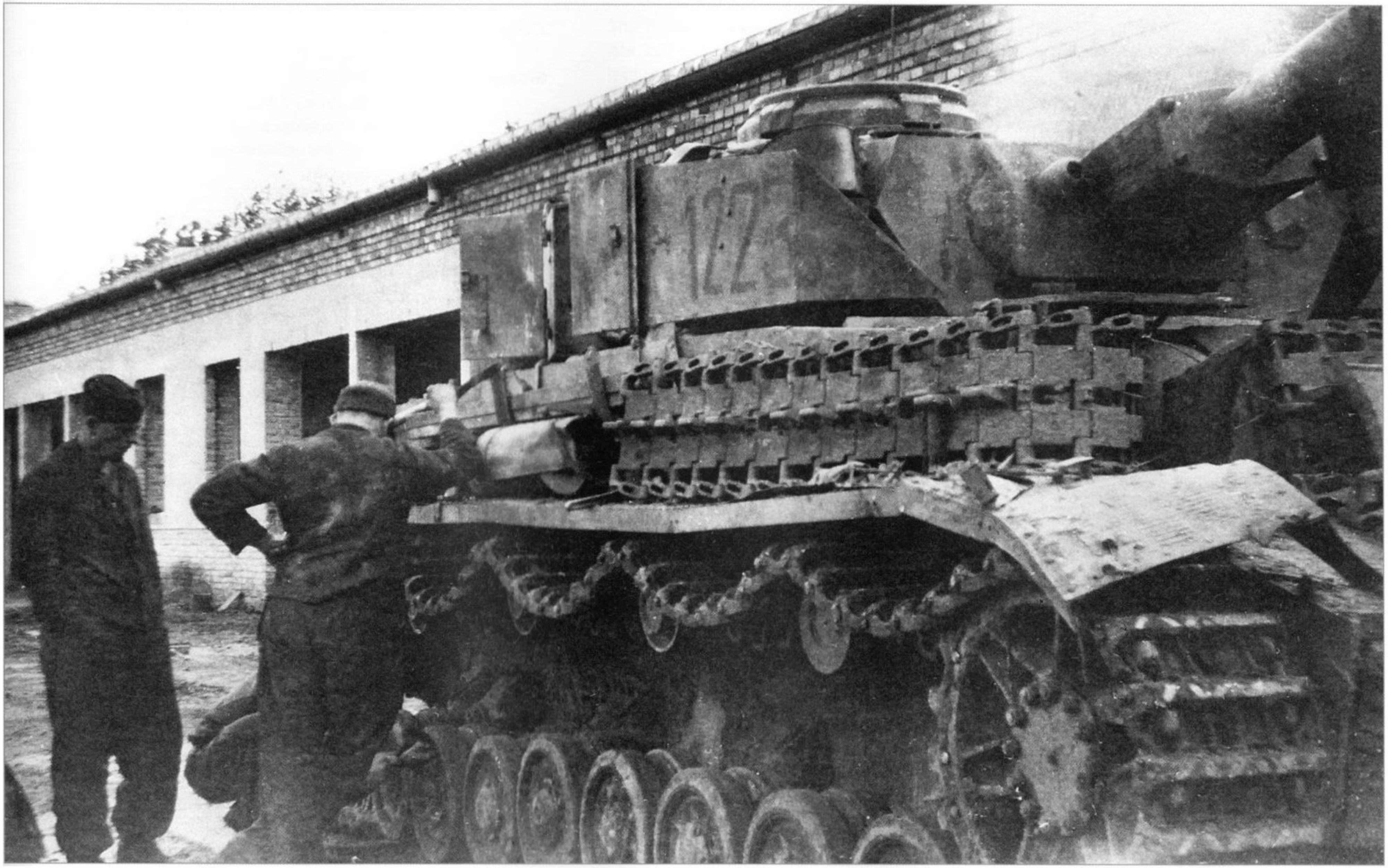
> *The operational readiness of Pz.Kpfw. and Stu.Gesch. entirely depends on spare part supply. The use of exchangeable components would lead to a saving in time and performance. The 'Heimatinstandsetzung' could increase their performance only to a certain extent because of the lack of spare parts. The need for spare parts and maintenance increased extraordinarily due to enemy action and the mud period.*
>
> *All spare parts that are not in stock or produced in sufficient numbers are designated as 'Mangelteile' (shortage parts) and listed in 'Engpasslisten' (shortage lists). The operational readiness eventually depends on the supply of those parts. The armament effort is too expensive and uneconomical as long as Panzers are lost due to insufficient coordination between spare part and series production. After a meeting among the 'Generalquartiermeister' and the 'Reichsminister für Rüstung und Kriegsproduktion' in January 1944 about the unsatisfying spare part supply, the situation significantly improved, but suffered a major setback in April 1944. A further decrease has to be expected. Many of the shortage parts were not supplied or only partially supplied in the past months. Not supplying those parts means Panzer losses at the front. The same applies to brand new Panzers that often fail on the first day already because of damage occurring to such parts. Consequently useless, they are lying around at the front or in the homeland for a long time.*
>
> *In April a significant number of new positions on the shortage list for Pz.Kpfw.III, IV, V, VI, engines and transmissions were not supplied. The seriousness of the situation in lacking final drives or their spare parts for Pz.Kpfw.III and IV were reported months ago. It has now led to a partial halt of the maintenance at the front. The 'Reichsminister für Rüstung und Kriegsproduktion' could not promise relief for what he called the "bankruptcy" situation of supplying final drives.*
>
> *Nowadays an infinite number of spare parts cannot be delivered from the depots but can only be picked up at the manufacturer. The 'Gerneralquartiermeister' has to be notified for every single part. To speed up maintenance, picking up spare parts at the manufacturer is barely acceptable for the Panzer-Instandsetzungs-K-Werke. For the bulk of the troops this single guided spare parts supply is neither possible information-wise nor transport-wise.*
>
> *To preserve the Panzer unit's fighting strength in the coming months it is key:*
>
> 1. *To increase the production of final drives for Pz.Kpfw.III and IV,*
> 2. *Complete delivery of all 'Sofortiger Nachschubbedarf' (immediate supply need) on every 10 Pz.Kpfw. produced in series, especially for Panther and Tiger,*
> 3. *Increase the spare part supply for le. Stu.Gesch.38t and delivery of the 'immediate supply need' with every 10 Stu. Gesch.,*
> 4. *Complete delivery of all spare parts on the shortage list is indispensable, even under reduction of the series production.*

A different and thus interesting source is an 18 year old POW who reported from a ZEL in Italy as of June 1944. He said:

> *The spare parts supply for motorcycles was satisfactory. The manufacturers Zündapp and Triumph (both region Nuremberg) still sent out 100%. DKW last sent 70to of motorcycle spare parts in May. Trucks and car manufacturers sent sufficient quantities. However, parts which were subject to high wear were scarce. Opel sent 100to of spare parts, yet they only fit the civilian vehicle types. On the other hand, parts for the military versions were difficult to obtain. Mercedes was a few months in arrears, but supplied large quantities in May and June. A great shock was the message that the Renault plant had been heavily bombed. The 26.Panzerdivision alone had 528 Renault trucks, which needed spare parts regularly. The division immediately sent a representative to France in order to buy as many spare parts as possible - no matter what their condition was. Other units acted*



▲ We do not know how this happened, however, if you want to win best-of-show at your next model exposition, try to replicate these vehicles of the 24.Panzerdivision. The Maultier pushed the Pz.IV's gun to full elevation. *JH*



▲ Another 24.Panzerdivision vehicle. It has a mix of return rollers and what looks like Zimmerit on the front fender. The tracks on the right hand side are fitted 'backwards'. *JH* *the same and so stood in competition with each other.*

Thanks to Timm Haasler and Martin Block:
In a notice of the Gen.Insp.d.Pz.Tr. from 21 August 1944 it was written that the 'General der Panzertruppen West' is put in charge of all personnel and material supply for armored units of the army and the Waffen-SS in the West with immediate effect. Therefore, two 'Panzerstützpunkte' will be established:

- 'Stützpunkt' A (North) in the area west of Namur
- 'Stützpunkt' B (Middle) in the area east of Verdun.

In a document dated 6 September 1944, it was noted that Gen.d.Pz.Tr. West planned to order the establishment of a 'Panzerstützpunkt South' in Hagenau on 11 September 1944. As of 14 September it was located in Hagenau, while the I-Dienste were already deployed east of the Rhine, in the area of Rastatt. The purpose of the 'Stützpunkte' was to:

- Record and forward the entire supply of Panzers, armored vehicles, personnel and spare parts for the armored units of the army and the Waffen-SS in the West.
- Assist the armored units in all aspects.
- Centralize repair of long-term break-downs of Panzers.
- Further training of specialists, replace inept personnel.
- Collect crews without Panzer.
- Direct spare part supply.

From now on, all supply in the above sense was sent exclusively to the 'Stützpunkte', directed by In 6 and the Gen.Insp. The Sturmgeschütz-Abteilungen of the Inf.Div. and the Sturmgeschütz-Brigaden of the artillery were also assisted by the 'Stützpunkte'.

Regarding Panzer repair as of 21 August 1944, it was planned that a 'Stützpunkt' should have a Panzer-Werkstatt-Zug, two I-Gruppen, 10 Zgkw. with low-bed trailers for Pz.Kpfw., three Volkswagens, a gantry crane and a workshop tent. More maintenance units could be deployed in accord with O.Qu. West. By 15 September the Gen.d.Pz.Tr. West proposed for a future K.St.N. of a 'Panzer-Stützpunkt':

Gruppe Führer
  7 Officers, 2 'Beamte', 7 NCO, 18 enlisted personnel.
  4 motorcycles (2 w/sidecar), 6 le. Pkw (4-seats),
  1 Lkw 3to (open) for little field range cooker, 1 Lkw 3to (open) for provisions.
Berge-Zug
  1 Officers, 3 NCO, 10 enlisted personnel.
  1 le. Pkw (4-seats),
  5 Zgkw.18t (Sd.Kfz.9),
  2 low-bed trailers for 23to, 2 low-bed trailers for 60to.
Betriebsstoffkolonne
  1 NCO, 19 enlisted personnel.
  10 Lkw 3to (open).
Ersatzteilkolonne
  1 NCO, 9 enlisted personnel.
  5 Lkw 3to (open).
1. - 3. Kfz.Instandsetzungsgruppe
  Each 3 NCO, 16 enlisted personnel.
  Each 1 le.Pkw (4-seats), 1 Lkw 2to (open), 1 Lkw 3to (open), 1 Lkw 4.5to (open),
  Each 2 le. Zgkw.1t (Sd.Kfz.10) or Gleisketten-Lkw 2to (Maultier).

The Panzer-Divisions could agree on collection points for their damaged Panzers. The transport of vehicles from there to the Pz.Inst.Abt. was then the responsibility of the 'Stützpunkte'.

On 28 August the 'Oberbefehlshaber West' GFM Model ordered that the following maintenance units were subordinated to 'General der Panzertruppen West':

Pz.Inst.Abt.551
Pz.Inst.Abt. (bodenst.) Paris
Pz.Kw.Wkst.Kp.656
Pz.Kw.Wkst.Kp.928
Pz.Kw.Zug (bodenst.) 941
Pz.Kw.Zug (bodenst.) 942

Pz.Kw.Zug (bodenst.) 943
Pz.Berge-Kp. 8
Pz.Nachschub-Btl. [designation unreadable, probably F] and branch office Epernay.

Immediately begin establishing:

- *Stützpunkt North, in the area Liège with advanced Stützpunkt Mons.*
- *Stützpunkt Middle, in the area Verdun with advanced Stützpunkt Bazancourt (northwest [sic] of Reims).*
- *Panzer spare part depot F remains in Etain. Another depot shall be established in Liège.*

'Stützpunkt' North supported the 1., 2., 9., 10. and 12.SS-Pz.Div. as well as the 2.Pz.Div. 'Stützpunkt' Middle supported the Pz. Lehrdivision, 9., 11., 21., and 116.Pz.Div. as well as the 3., and 15. Pz.Gren.Div.

The Panzers repaired at the subordinated Pz.Inst.Abt. and Pz.Wkst. Kp. must be reported to Gen.D.Pz.Tr. West for redistribution. In principle the Panzers shall return to their units. The recovery units of the 'Stützpunkte' shall work primarily at night and to the limits of their capacity.

On 3 September, Gen.d.Pz.Tr.West noted Stützpunkt Nord's evacuation to Düren, Stützpunkt Mitte to Kaiserslautern, spare parts depot Etain to the area north of Wiesbaden.

On 6 September, the 'General der Panzertruppen West' wrote that the personnel and material situation does not allow to replenish the units according to 'Panzer-Division 44, freie Gliederung'.

Also as of 6 September, the 1., 2., and 12.SS-Pz.Div., the s.SS-Pz. Abt.101 and 102 as well as the s.Pz.Jäg.Abt.654 were no longer assigned to 'Panzerstützpunkt' North. Their 'Abholkommandos' at the 'Stützpunkt' had to move to the replenishment area of their parent unit. 'Panzerstützpunkt' North had established maintenance facilities in Ichendorf, 15km west of Cologne, and Krevenbroich, 25km northwest of Cologne.

The 2. and 116.Pz.Div., the 9. and 10.SS-Pz.Div. and the Sturm-Pz. Abt.217 were still assisted by 'Panzerstützpunkt' North. They each had to station 15 crews for Stu.Gesch. and 15 crews for Panzers for picking up new vehicles; Sturm-Pz.Abt.216 had to station 10 crews. The s.Pz.Jäg.Abt.654 was ordered to leave their two Bergepanthers with crews at Düren.

By that time, the 'Stützpunkt' North was in Jülich/Düren with Pz.Inst. Abt. (bodenst.), III/Pz.Wkst.Kp.928, I/Berge-Kp.8 and Pz.Wkst.Zug (bodenst.) 943 and the 'Stützpunkt' Middle was in Kaiserslautern with III/Pz.Wkst.Kp.55, Pz.Wkst.Zug (bodenst.) 941, Pz.Wkst.Zug (bodenst.) 942, II/Pz.Berge-Kp.8 and II/Pz.Wkst.Kp.928.

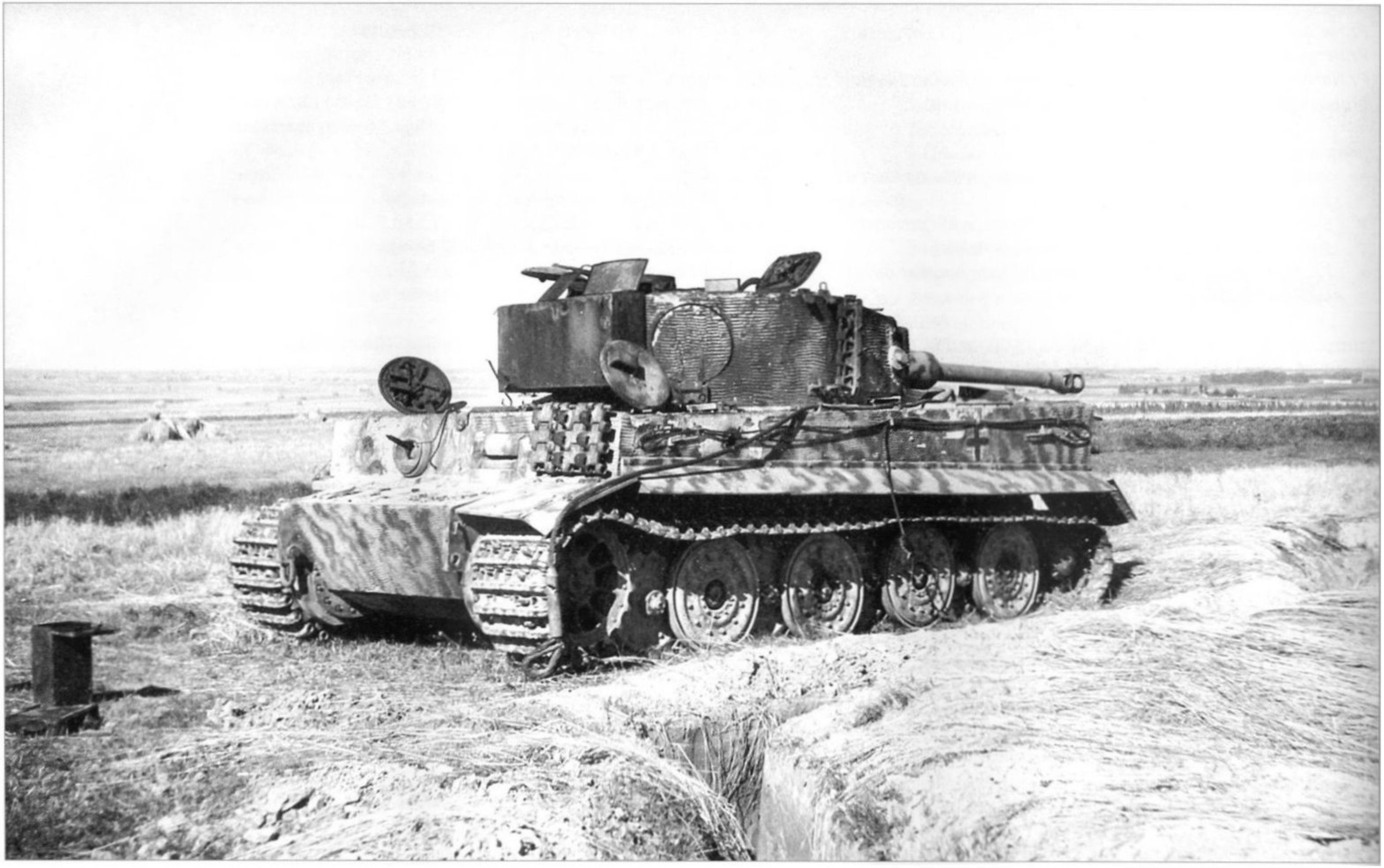
Around the 14 September the 'Stützpunkte' North, Middle and South were ordered to each establish an advanced Panzer spare parts issuing office. These offices were only allowed a size of a stock that they could evacuated with their own vehicles if necessary.

'Stützpunkt' North was ordered to relocate to Bergisch-Gladbach on 14 September 1944.

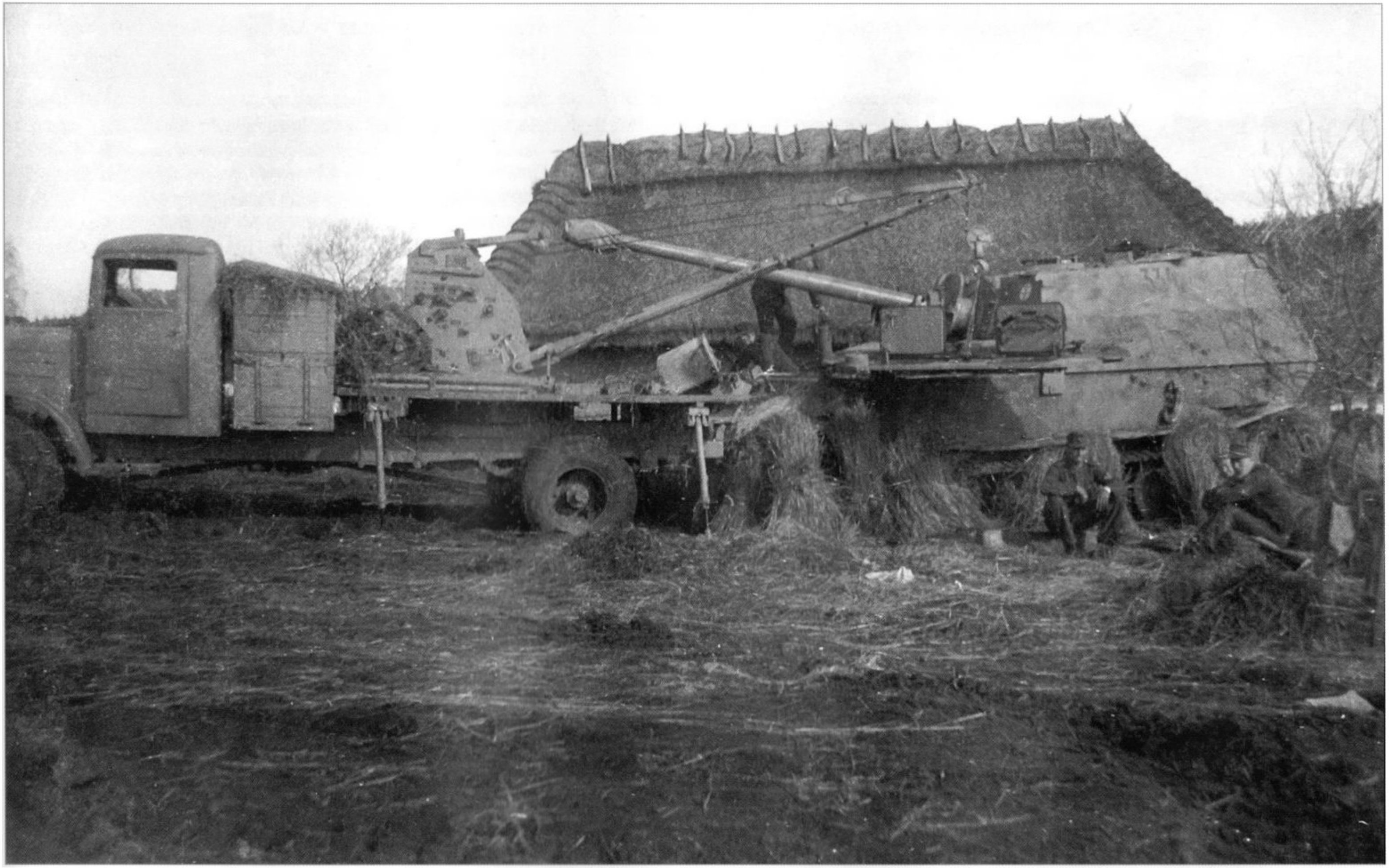
As of 15 September, the maintenance situation looked like this:

Pz.Wkst.Zug 928 in Hüls near Krefeld:
From SS-Pz.Div.Frundsberg:
4 Stu.Gesch.IV 7.5cm L/48
1 Pz.Kpfw.III 5m
1 Bef.Pz.Kpfw.III
1 Stu.Gesch.III,
From an unknown unit:
1 s.I.G. 38(t)
1 SPW (3t)
All general engine failures, one Stu.Gesch.IV with full penetration of its gun barrel.

Pz.Wkst.Zug 943 in Wülfrath near Düsseldorf
From an unknown unit:
2 Bef.Pz.Kpfw.III
1 Pz.Kpfw.III 5cm



▲ This Tiger shows a significant hit on the front armor plate and on the left side behind the driver. The vehicle probably burnt out in Summer 1944. So far the unit cannot be identified. *AMC*



▲ A Kfz.100 and Ferdinand '334' appear to be crossing swords on a straw covered field somewhere in Russia. A section of the Ferdinand's hull roof (with the driver and radio operator's hatches) has been removed and set aside for the time being. *AMC*

Pz.Kpfw. cannot be repaired with the means of the I-Zug. Planned to be sent to H.Za.Magdeburg.

Inst.Kp. 656 in Köln-Frechen:
Not yet ready to work. New quarters are inspected.

Panzerstützpunkt Nord:
12 Pz.Kpfw.V
4 Pz.Kpfw.IV
2 Pz.Jäg.IV
5 Stu.Gesch.IV
2 Pz.Kpfw.III 5cm
3 Bef.Pz.Kpfw.III
1 Stu.Gesch.III
1 SPW
1 s.I.G.38(t)

The 'General Panzertruppe West' noted in a different document of the same date:

> *The 17.SS-Pz.Gren.Div. needed as replenishment: 423 motorcycles, 140 Pkw and 1,230 Lkw. The O.Qu. cannot supply any Lkw. for the time being.*
> *As not enough towing vehicles were available for le.F.H. and s.F.H. they could not all be distributed. Thought about employing them in the 'Westwall'. Same for Flak without towing vehicles. It was proposed to employ them as Flak-Kampftrupp in the 'Westwall' or to protect bridges crossing the Rhine.*

A note of a meeting held at the 'Stützpunkt' North on the 15 and 17 September 1944 stated that it needed two low-bed trailers 22to and one low-bed trailer 60to. The writer noted that a 60to trailer was supposed to be in Ulm. Nothing more is known about this trailer.

Oblt. Heigl of Sturm-Panzer.Abt.217 reported that soldiers of the 'Westwall' were surrendering (überlaufen) to the enemy without a fight. A motion must be brought forward to authorize shooting at such people.

A letter to the 'General der Panzertruppe West' from 16 September 1944 indicated:

> *Panzer-Abt.112 was practically annihilated* [in a US attack southwest of Epinal]. *It has been left with only four operational Panthers, three Panthers in need of short-term maintenance and one Befehlspanzer in need of long-term maintenance. 34 Panthers are total-losses. Virtually no technical damage occurred. The exclusive reason for their total-loss was air attacks by 16 - 20 Jabos with rockets and phosphor grenades from the rear. The loss of crews is high.*
> *A recovery of the total-losses is superfluous because the Panzers burnt-out completely or blew up by their own exploding ammunition.*

On 20 September the location of 'Panzerstützpunkt' North was Bensberg, 'Panzerstützpunkt' Middle was in Kaiserslautern and 'Panzerstützpunkt' South in Hagenau.

On 21 September the Gen.Insp.d.Pz.Tr. assigned five Bergepanthers to the Gen.d.Pz.Tr. West which planned to keep one at the disposal of 'Panzerstützpunkt' North. 'Panzerstützpunkt' South had to be immediately evacuated east of the Rhine to the area Pforzheim on 23 November 1944. The 'Stützpunkt' had to move again and was evacuated to Mühlacker on 10 December 1944.

An independent 'Panzerstützpunkt' J was ordered by the Ob. West to be ready on the 11 December 1944 at 7 p.m. to support the replenishment units ('zur Betreuung der Auffrischungsverbände). Its temporary location was Mayen.

Speer returned with an interesting but tardy deliberation from a trip to the Western Front (7 - 10 December 1944) and noted it on 11 December 1944. His idea could and should have been anticipated and then implemented into the war armament program years before. It also shows how Speer was still planing for a longer future even though the war was all but lost.

> *While it is generally correct to manufacture as many complete*

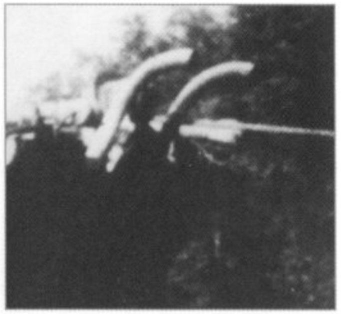
> *Panzers as it is possible to manufacture, exactly the contrary point of view must be taken with a concentrated employment of Panzers with long supply routes. With a concentrated employment of large Panzer numbers the number of the non-operational tanks will grow relatively fast if the necessary spare parts are not on the spot. I could convince myself of the fact that everywhere the maintenance units of the armored divisions work excellently, so that a high number of operational Panzers, especially at the H.Gr. B is guaranteed, as long as the necessary spare parts are available.*
>
> *In addition, with long supply routes, like it is always the case with the traffic conditions in the area left of the Rhine, are unfortunately always necessary, a proportion of the new Panzers break down on their advance route. On the other hand, spare parts brought forward by truck need only a fraction of the transport capacity; and the repaired Panzer only needs to travel a short distance [from the Werkst.Kp.] back to the front so that risk of it breaking-down is considerable lower than the Panzer which has to travel the whole supply route.*
>
> *Using the same transport capacity as a basis, which will be crucial especially at H.Gr. B in the future, one can make the following calculation:*
>
> - *With a long supply route half of the newly supplied Panzers break-down.*
> - *Spare parts only need one-fifth of the transport capacity of a Panzer.*
> - *The fuel consumption of the supply truck is maximum one-twentieth of a Panzer.*
>
> *Therefore it will be necessary to supply enough spare parts for the upcoming battles of H.Gr. B, even if it means that the Panzer production will drop a little a few weeks later.*

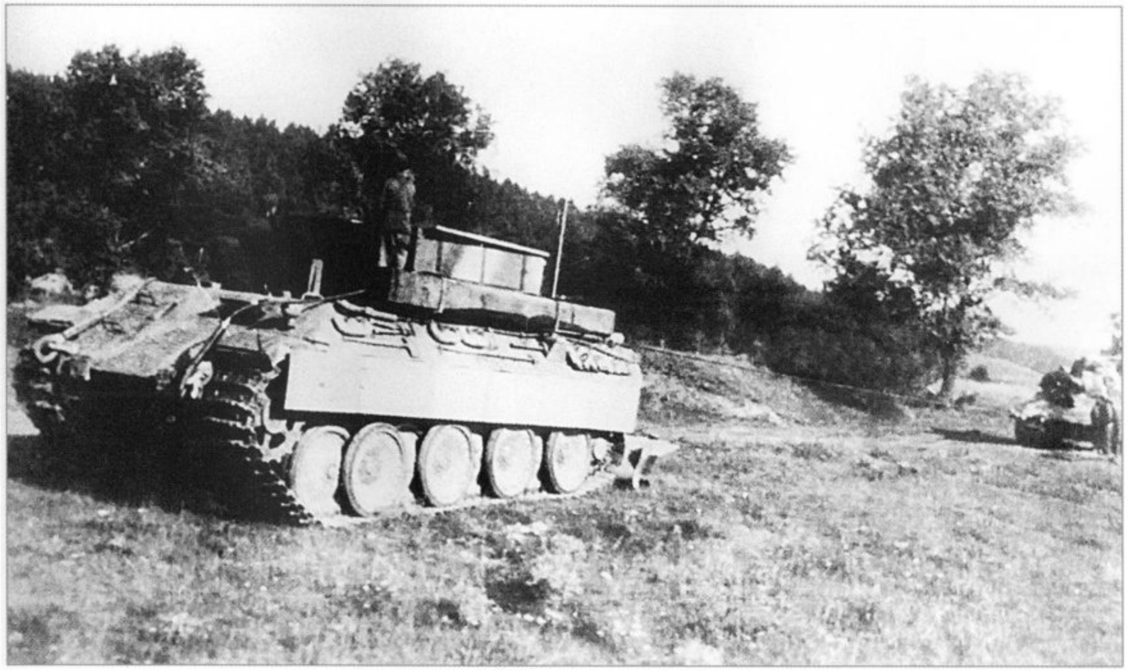
Guderian shared a similar insight at a Führer presentation a year earlier on 22 December 1943:

> *Pz. spare parts production does not meet the requirements yet.*
> *On average, one train brings 10 Panzers to the front. However, one Pz. spare part train can supply around 300 Panzers.*

On the Eastern Front, s.Pz.Abt.503 reported as of 15 December 1944 that it had 50% of spare parts and 30% on the way. It needed 2to makeshift cranes for Pz.VI., Volkswagen spare parts vehicles, large air tires 270x20 and 190x20, tracks for Zgkw. and Maultiere, steering gears, transmissions and engines for Pz.Kpfw.VI/II. On 7 December 1944, eight Pz.Kpfw.VI/II had to be blown-up due to the lack of spare parts and recovery means as well as the late arrival of SSyms wagon.

▼ The exhaust pipes on some Bergepanthers were extended considerably to avoid being damaged by the rear spade during travel and recovery operations. *MJ*





▶ This Bergepanther features 'Zimmerit,' chevron tracks, two handles on the front and extended exhausts. It is towing a Tiger II. Nobody wanted to build the Bergepanther because it disrupted their series production. That is why its production was handed from M.A.N. to Henschel to Daimler-Benz and ended up at DEMAG. *MJ*

1945: Last Reports

The O.Qu. of Heeresgruppe Weichsel sent an overview about their Panzer stock as well as the deployment of the Pz.-Inst.- and Bergedienste as of February 1945 to Gen.Insp.d.Pz.Tr. Despite that they are not representative for the rest of the war, the excerpts concerning the spare parts are reflected here. It is winter, it is 1945 and the troops are in retreat if not to say collapse. But it gives a picture of just exactly that time of the war.

Pz.-Spare Parts:

In general the requests of the troops could be fulfilled except the Engpass-Ersatzteile. Difficulties occurred on the way from the H.Pz.Za. to the Pz. spare part depot due to transport difficulties. Especially missing were spare parts for Jagdpanzer 38.

150 rail road wagons full of Panzer spare parts for Pz.Kpfw.III were evacuated from He.Pz.Neb.Za.Gülzow/Pom. to Grafenwöhr and Schwerin.

SS-Pz.Abt.503 was especially supported in the supply of a large number of new engines, transmissions and steering gears for Tiger II.

There is also an exceptional high demand for spring brackets of Pz.IV L/70. They cannot bear the weight and easily distort and break off.

Pz.-Ersatzteillager

a. Pz.-Ersatzteillager OKH 'C' is in Glövzin-Premslin (10km north of Perleberg).

aa. Advanced 'Ausgabestelle' Rüdnitz (5km northeast of Berna). Holds tracks for Pz.III and Pz.IV, spare parts for chassis Pz.III (except engines, transmissions, final drives and road wheels)

bb. Advanced 'Ausgabestelle' Stettin

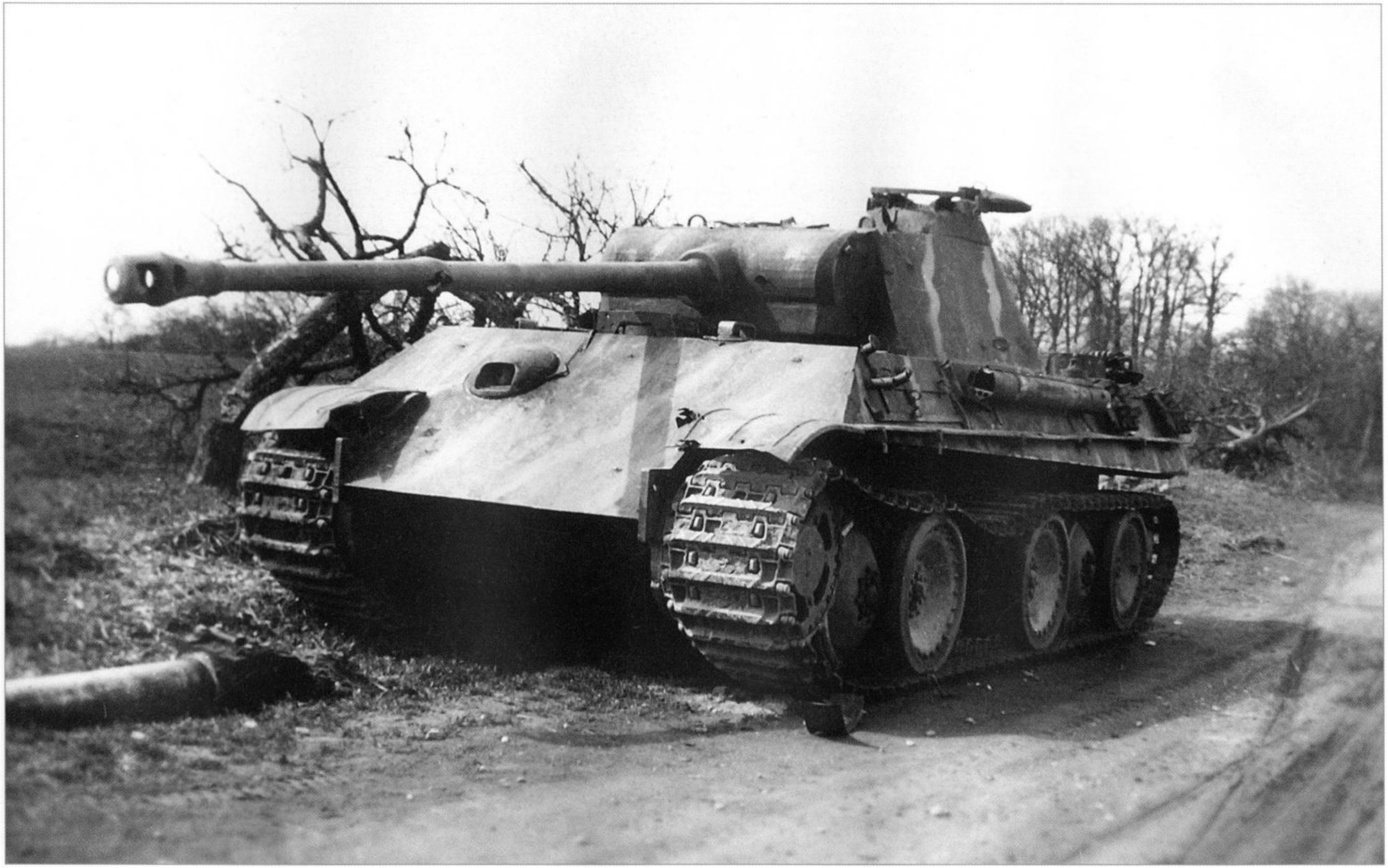
b. Heeres-Pz.-Nebenzeugamt in Gülzow (Pommern)(55km north Stargard).

c. WEL Torgelow (15km north Pasewalk). Spare parts for Maybach engines HL 120 (Pz.III and Pz.IV).

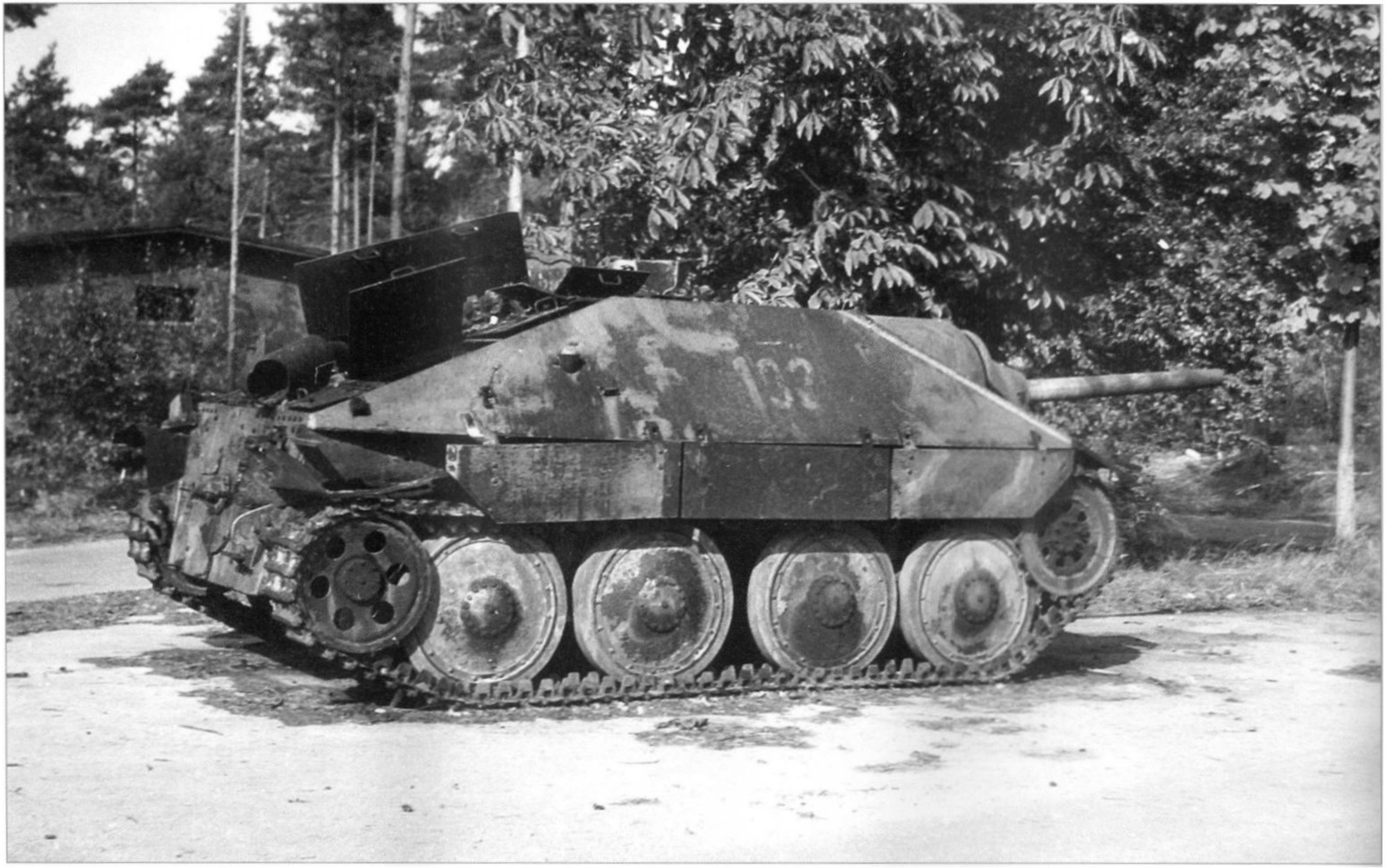
d. Pz.Ersatzteil-'Ausgabestelle' for Tiger II in Iringhausen by Kassel.

According to the overview of HGr. Weichsel, a total of 328to of spare parts was handed out in February 1945, 385to were in stock on 28 February 1945. Interestingly, among the spare parts handed out in February 1945 were also two engines H 62 T R and four transmission SS G 46 for the Pz.Kpfw.II. Other parts were 51 engines and 26 transmissions for Pz.Kpfw.III, 56 engines and 14 transmissions for Pz.Kpfw.IV, 4 engines and 4 transmissions for Pz.Kpfw.38, 3 engines and 3 transmissions for Jagdpanzer 38, 26 engines and 15 transmissions for Pz.Kpfw.V, 5 engines and 5 transmissions for Tiger I and 3 engines and 12 transmissions for Tiger II.

▼ Susice, Czechoslovakia, May 1945. Wrecks on their way back to the homeland as captured on motion picture film by a US cameraman. The mix of vehicles is interesting; German Russian and a Hungarian Pz.Kpfw.IV Ausf.J *LA/WA*



▲ A Pz.KpfwV Ausf.G with raised crew heater. The gun barrel is damaged, a road wheel is missing, and the turret took a grazing shot to the side. The damage may have occurred in five minutes or over five days. Germany, 1945. *AMC*



▲ A Jagdpanzer 38 abandoned in Germany, 1945. The interpretation of the remaining camouflage and black soot is left to the modelers among our readers. *AMC*

6

More Influencing Factors

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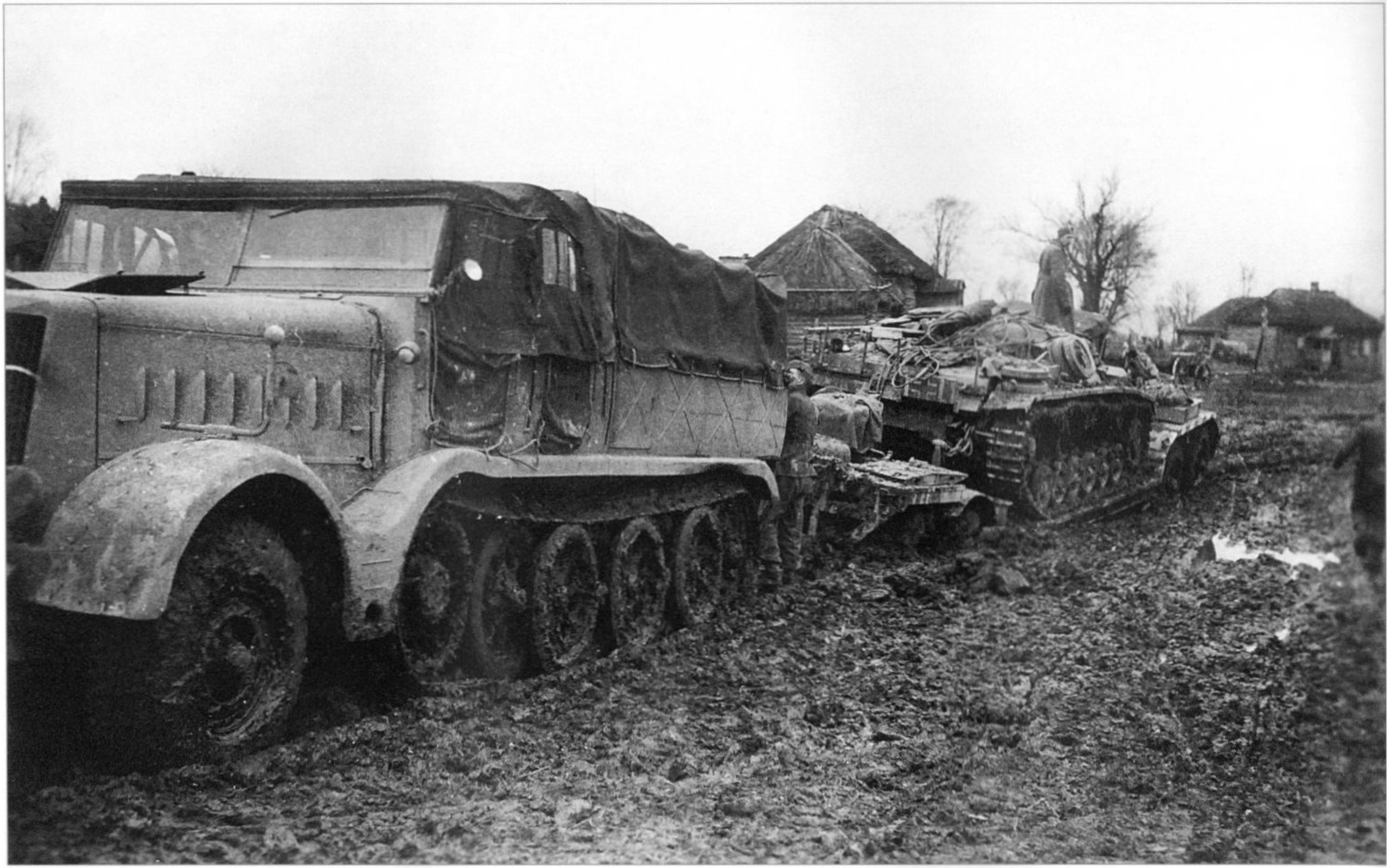


▲ Parts of StuG.Abt.177 negotiating a Russian road. Several reports stated that the Zgkw.18t was the only vehicle in the German arsenal that could manage the Russian mud. *AMC*

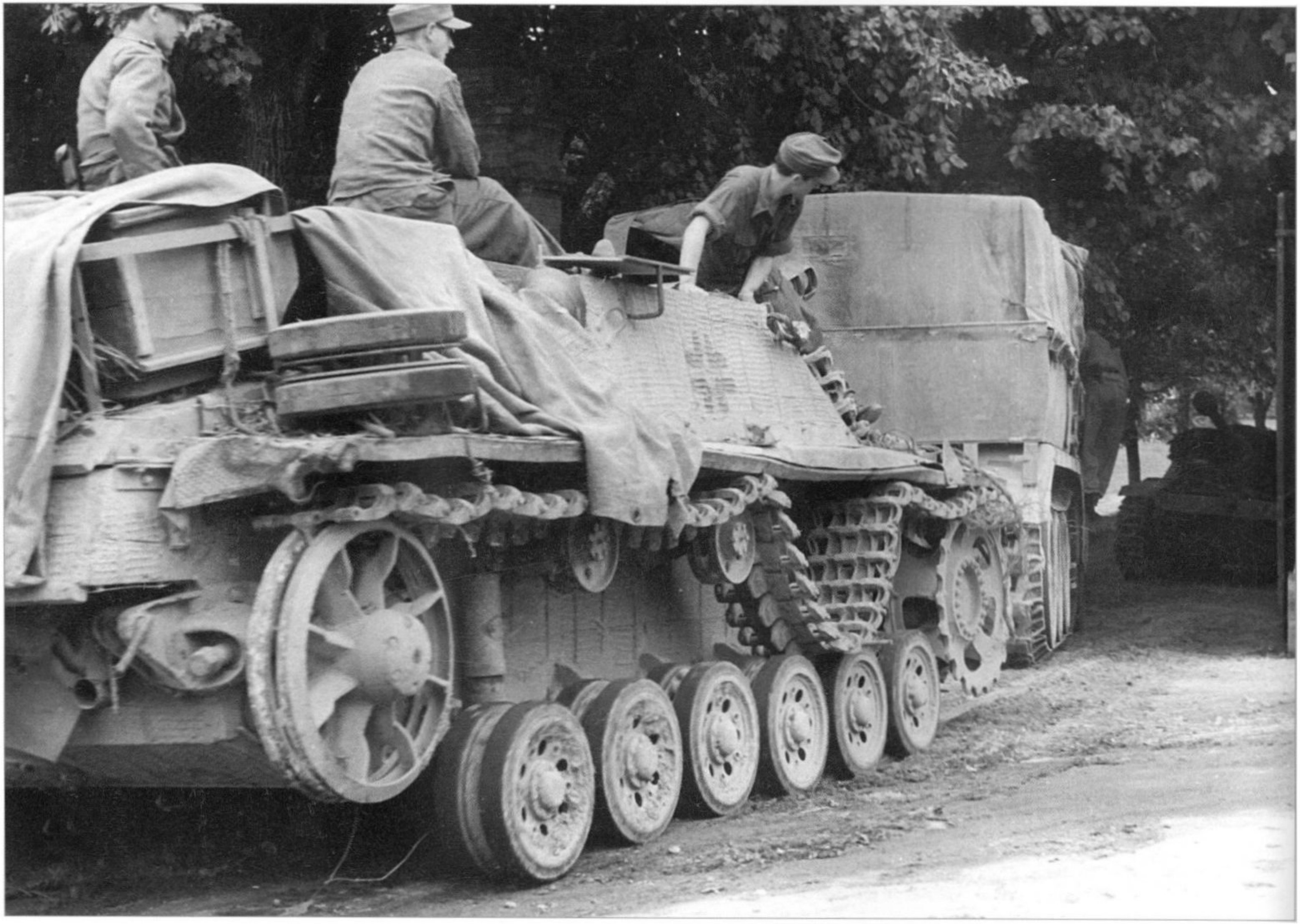
Recovery Vehicles

As seen, large numbers of total-losses occurred during withdrawals. To keep those total-losses small, sufficient recovery vehicles were needed. The Panzeroffizier of the OKH/GenStdH wrote the following memorandum as of 1 March 1944:

> *The preservation and strengthening of the combat effectiveness is not only achieved with the highest production, because every production can be exhausted by losses of the same extent, but by measures that keep losses low and lower them even more.*
>
> *To have a high stock of Panzers as consequence of a high production, the lifetime of Panzers must be extended with all available resources. Hence the task is to produce and to preserve. Only producing is uneconomical. The produced Panzer needs care and maintenance to fulfill its tasks as long as possible. Therefore Wkst. equipment, spare parts and recovery means must keep up with every production increase. This necessity has not been accommodated so far. The consequences can be found already because the Panzer losses in the last month show an alarming, continuously increasing tendency. This is not only a sign of the increasing hardships of the battles but, as the high numbers of blown-up Panzers show, a result of the lack of recovery vehicles. To secure the efficiency of Panzer production it is absolutely necessary to adjust the production of recovery vehicles to the one of the Panzers.*
>
> *The Panzer losses will hardly decrease, we cannot do anything to counter that, but we can decrease the losses that occur due to the lack of recovery vehicles. Every step-up in production without a step-up in recovery vehicle is uneconomical because it does not increase combat strength but only increases the losses. The equally important question of spare parts and workshop equipment has not been touched in this study on purpose. Based on experience a key needs to be found to define the ratio between Panzer production and recovery vehicle production. The ratio will be different for various Panzers and also depends on the kind of recovery vehicle. The following rule of thumb can be formulated for Panzer units: For 10 Panzers one recovery vehicle if one alone can recover one Panzer. Applied to the Zgkw.18t:*
>
> *1 Zgkw. for 10 Pz.Kpfw.IV or Stu.Gesch.*
> *1 Zgkw. for 5 Pz.Kpfw.V*
> *1 Zgkw. for 3 Pz.Kpfw.VI*
>
> *If the development of recovery vehicles on Panzer chassis will be successful, the following production ratio will be required:*
>
> *1 Berge-Panzer 38t for 10. le.Stu.Gesch. 38t*
> *1 Berge-Panzer IV for 10 Pz.Kpfw.IV and Stu.Gesch.*
> *1 Berge-Panzer V for 10 Pz.Kpfw.V and Jagdpanther*
> *1 Berge-Panzer V for 5 Pz.Kpfw.VI and Jagdtiger*
>
> *The production of recovery vehicles based on this key will lead to higher combat strength faster and will save expenses on labor and raw materials than only new production of Panzers, which will lead to their quick loss.*

A similar line was taken by Oberstltn. i.G. and Chef Abt.III with the Gen.Qu. Riedel, who had the chance to attend a meeting about the February Panzer production prior to a discussion about Panzer maintenance with Speer on 22 February 1944:

> *Under the presidency of Hdl. Saur [Hauptdienstleiter Saur, Chef des Rüstungsstabes] it was discussed for a total of two hours if 30 instead of 26 of a certain Pz.Kpfw. type could be produced. With other types it was disputed why the planned output could not be reached. The unfavorable result due to air raids was commented by Mr. Saur with: "Terrible, terrible, terrible".*
> *Afterwards the increase of the Sturmgeschütz production was treated as the momentarily most urgent Führer request. Because the Sturmgeschütz production has been badly affected by air strikes, it was ordered to convert 100 evacuated Pz.Kpfw. to Stu. Gesch. to reach the number demanded by the Führer. Again, everything centered around the number.*
> *I then made the offer that 581 more Sturmgeschütze could*



be made operational at the front and counted to the number demanded by the Führer under the condition that something was done for spare part supply. I then said that it was the first time that I had the honor to take part of such a meeting and so far only heard the struggle for the number. The need of the hour is to have the largest mass of Panzers and assault guns operational at the front. Part of this is not only the output but also maintenance in the homeland and at the front. These three things have to be treated as a whole. I offered Mr. Saur to also take over responsibility for maintenance at the front in a way that with an adequate spare part supply the highest possible number of Panzers are ready for the front. The operational number could then be reported to the Führer.

Mr. Saur purposely avoided the spare part question and emphasized the importance of evacuating Panzers even with minor damaged to the homeland for maintenance. He merely said: "If we did not have to give the front any spare parts, we would have them in the homeland abundantly. If it was not for the transport problem, all maintenance should be carried out exclusively in the homeland." I countered that evacuating Panzers which could be repaired with available spare parts within a few hours to the homeland was insane. He then explained that he was just speaking theoretically. Evidentially it was more economical to send an engine to the front instead of evacuating a 40 times heavier Panzer to the homeland. He will take charge over the supply of spare parts to the front by sending more specialists from manufacturers, such as engineer Häring from Maybach, to the front. I then answered that the troops always welcomed the experienced Ing. Häring. We were ready to accommodate such a specialist at any time. Unfortunately, not a single Olvar-transmission more has reached us despite the presence of Mr. Häring for almost one year. Ing. Häring's only task is looking for flaws and gaining experience for the further development for Maybach. Mr. Saur then asked for the following objective: The troops have to report their need for spare parts daily. This will then by transported by air effected by the Gen.Qu. Like this, the troops will know that they get what they ask for.

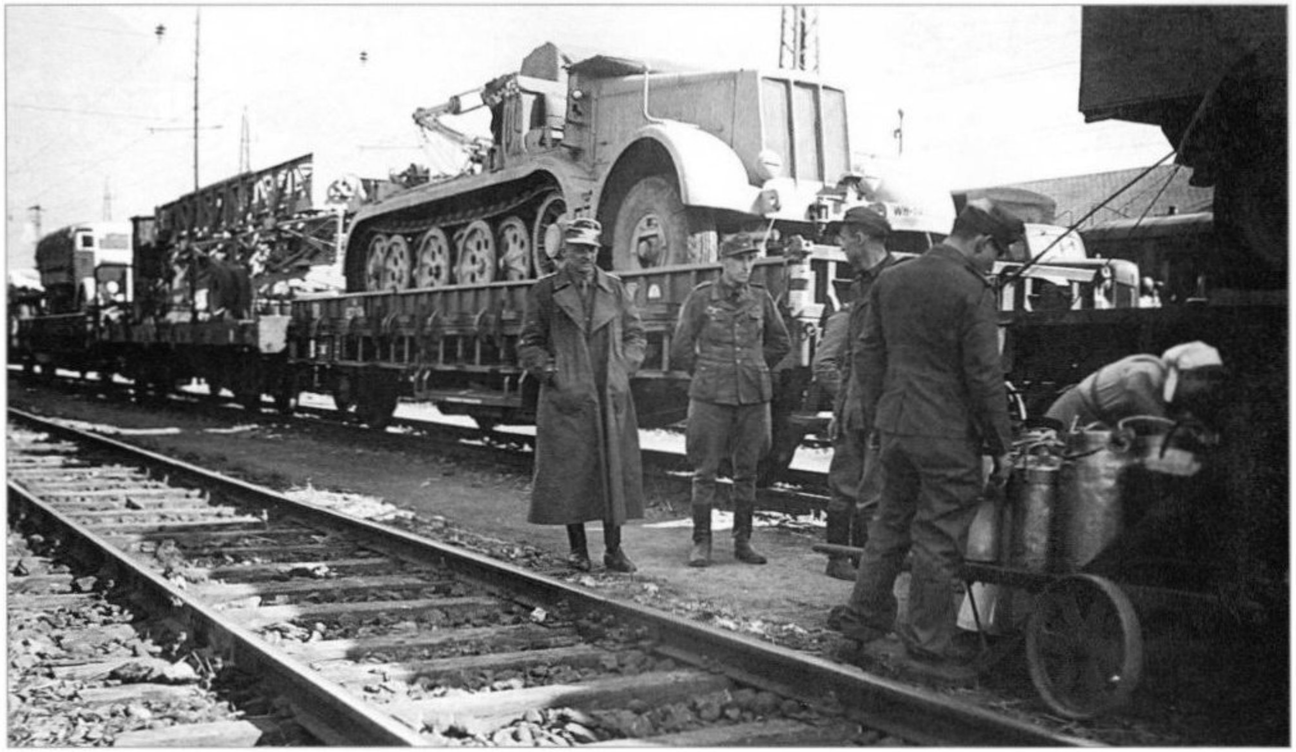
With the comment that spare parts are being flown for years I pulled a spare part request of the Tiger-Abt. SS-LAH and s.Pz. Abt.502 from my brief case. Aircraft were ready for the transport and the troops are awaiting the fulfillment of their requests by him.

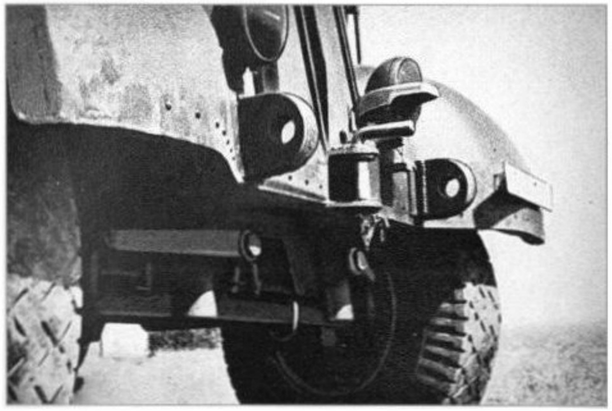
The argument kept going. Mr. Saur avoided taking a position, kept saying that he wants to carry out most of the repair work in the homeland, but this had to be decided by the Gen.Qu. because transportation etc. had to be taken into account. Riedel pointed out that the homeland maintenance is totally insufficient.

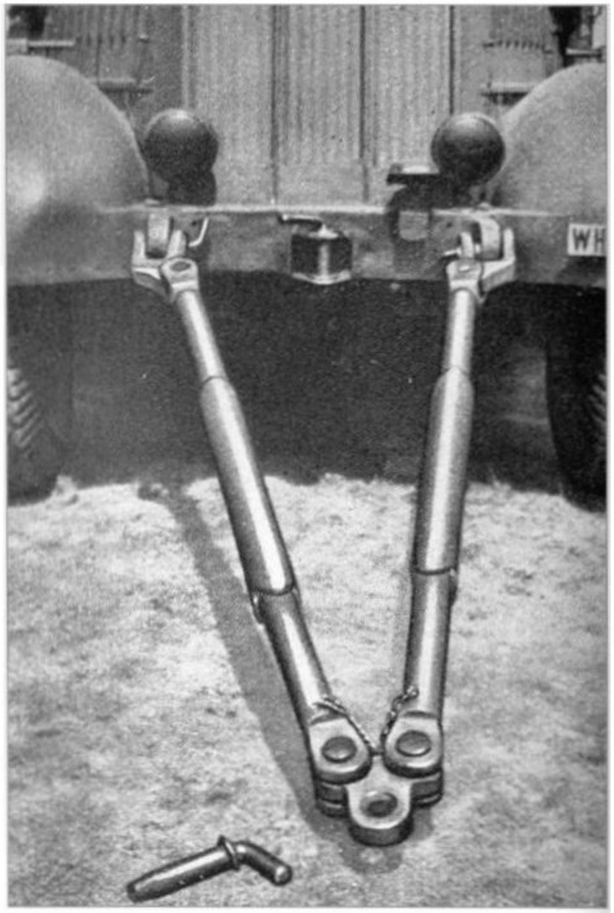
Altogether the meeting showed that the desire to have the maximum number of operational Panzers in the front line by a harmonious coordination of production and front and homeland maintenance is not realized. It is continuously ignored that by supplying the front with spare parts a maximum of maintenance performance could be achieved with a minimum of effort. This can neither be accepted nor understood by Mr. Saur because he and his entourage are solely focused on the production numbers. I neither have the feeling that the officers of the Waffenamt, of In 6 etc., have recognized the only solution to the problem.

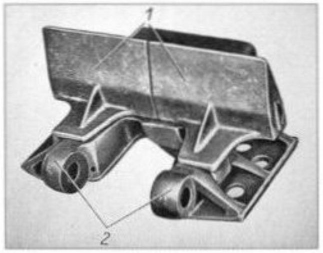
To illustrate the total situation of Panzers the following example is added: Three Tigers of s.Pz.Abt.508 are not operational because in four radiators the bevel gear shifts are damaged. All attempts of 'Aufstellungsstab West' to get the gear wheels for the exhaust fans through Panzer-Zeugamt Magdeburg, Fz. In, In 6, the Henschel company and the 'Reichsministerium for Rüstung and Kriegsproduktion' failed. The parts that actually exist are used exclusively for new production. The 'Aufstellungsstab West' thus requested three new Tigers to report combat readiness on schedule. Three Tigers from new production could effectively be made available for the Abteilung. If one considers that four bevel gear shifts weigh approximately 8kg all together, and four complete fans together weigh 340kg, but three new Tigers weight 174to in total, one demonstrates that the wrong path is followed when it is decided to send the Tigers.

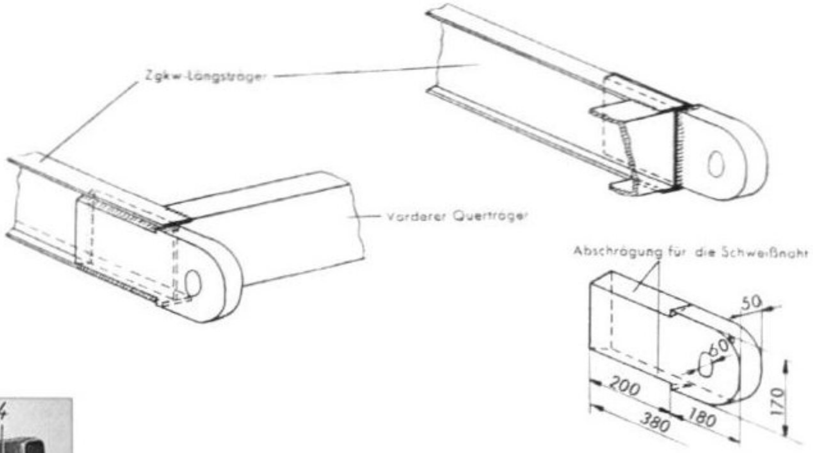
◀ Towing a Panzer on its wheels further damaged the suspension. Tracks were considered to be spare parts like any other spare part. *JH*

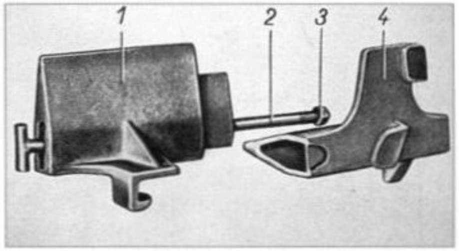






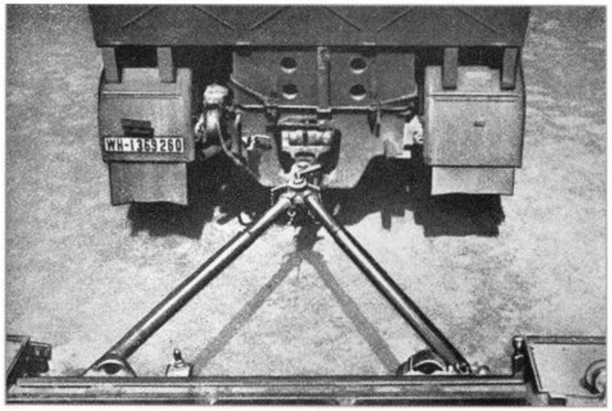


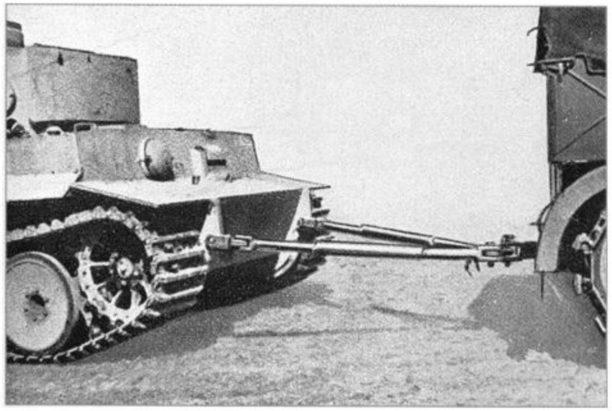

Zgkw-Längsträger
Vorderer Querträger
Abschrägung für die Schweißnaht
50
60
200
380
180
170

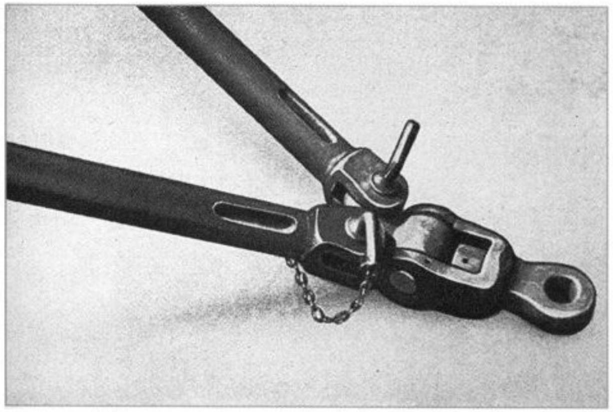


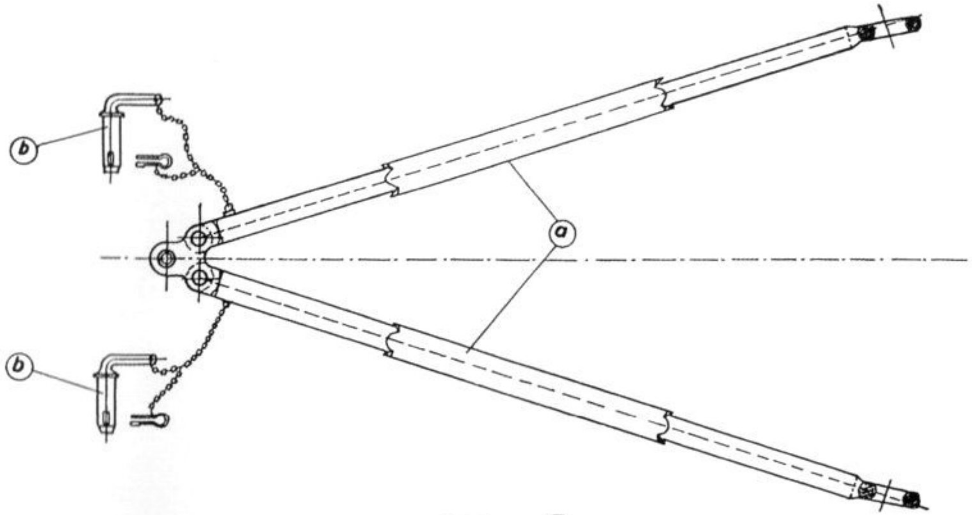
▲ Troop modification according to the Berge manual so that the Zgkw. could use tow bars at the front as well. The original middle hitch was too weak for a threefold pull. *AMC*

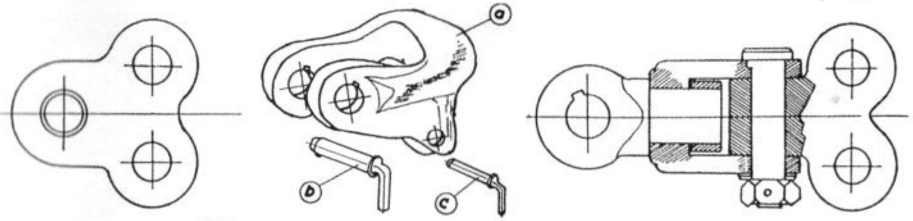
◄ 'Bergegreifer' (track cleat for recovery vehicle) could be mounted on every 4th track link of a Zgkw.18t in soft ground and on every 6th in very soft ground.

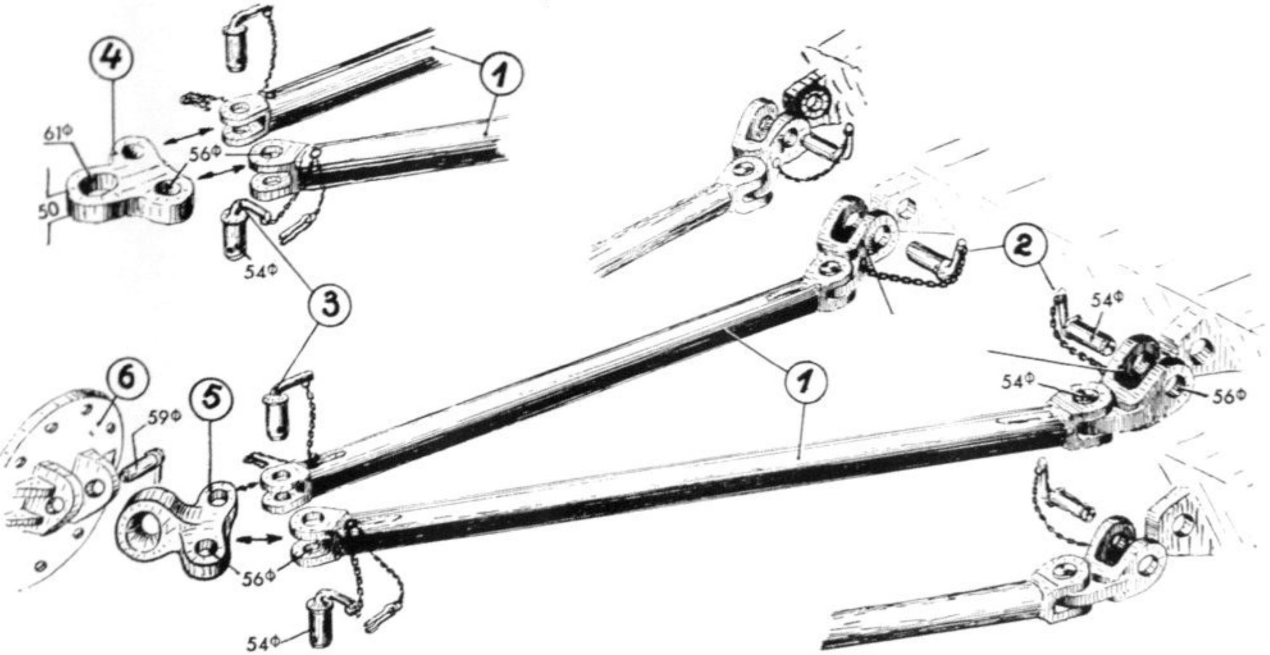






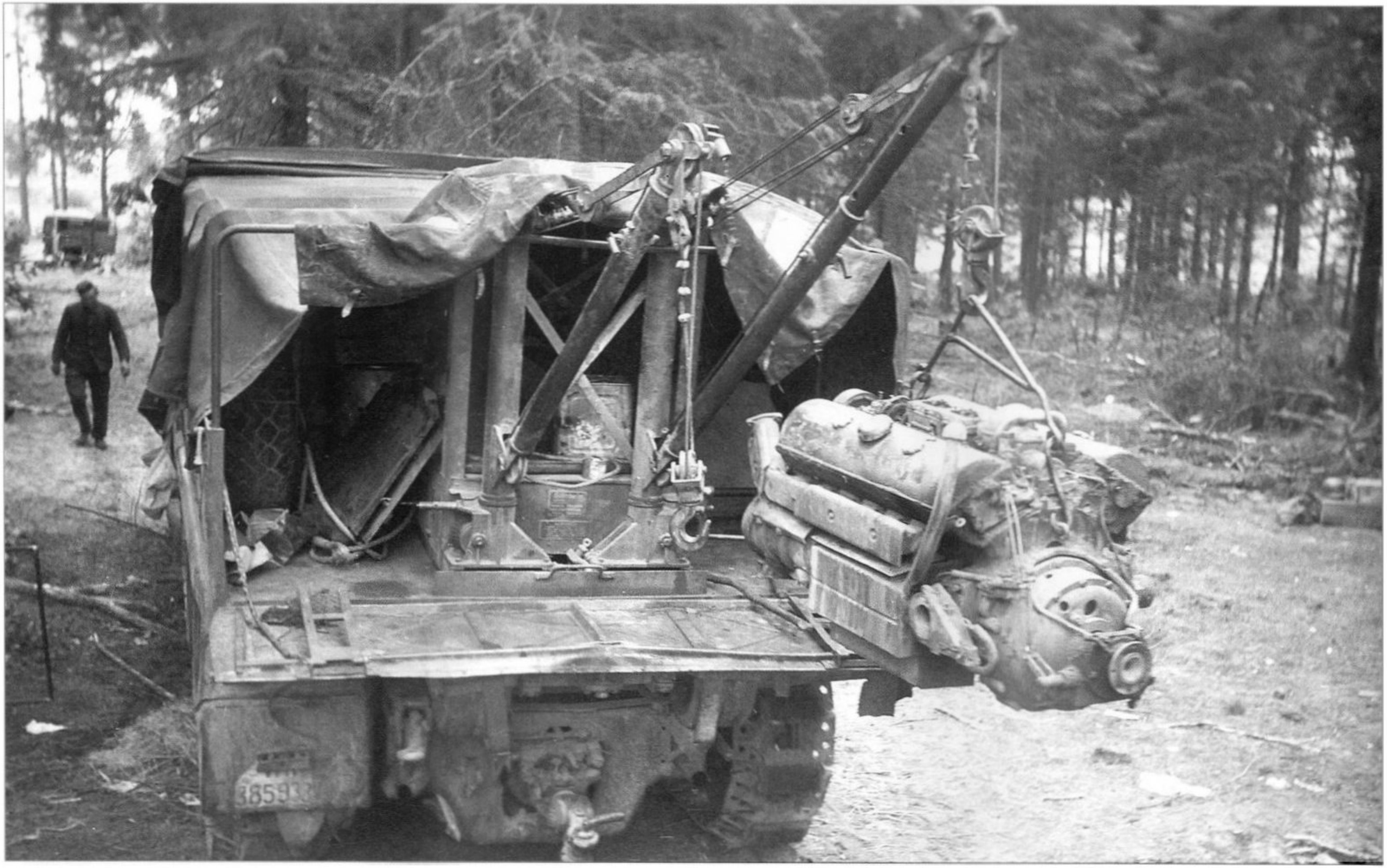






The top pictures shows 'leichte Abschleppstangen' (light towing bars) for Pz.Kpfw. up to a weight of 30to while the photo on the bottom shows heavy towing bars. In the middle are the different connectors. The 'Herzstück' could be used with a Zgkw. (also see extreme left top and middle), the connector on the right was used when a Panzer served as towing vehicle (also see extreme left bottom).

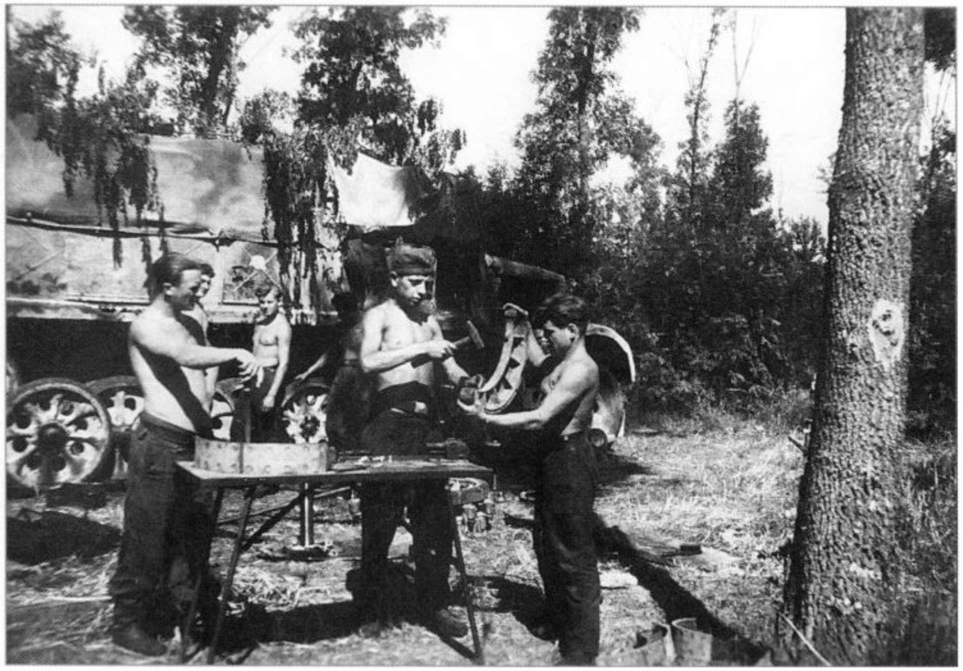
Vehicles that could no longer brake had to be towed with towing bars instead of tow cables otherwise they could run into the towing vehicle on a slope.



▲ A Bilstein crane mounted on a Zgkw.18t from StuG.Abt.197. The same crane can also be seen mounted on the Einheits-Diesel trucks. Hanging from it might be a Maybach HL 120 TRM engine with the transmission LA 120 HD in place. *JH*

▶ Repairs on the repair vehicle, the Zgkw.18t. The vehicle on the bottom left is a s.Zgkw.12t (Sd.Kfz.8). Its road wheels have different cut-outs compared to the 18to Zugmaschine. *3x VR, 1x HE*

30Km



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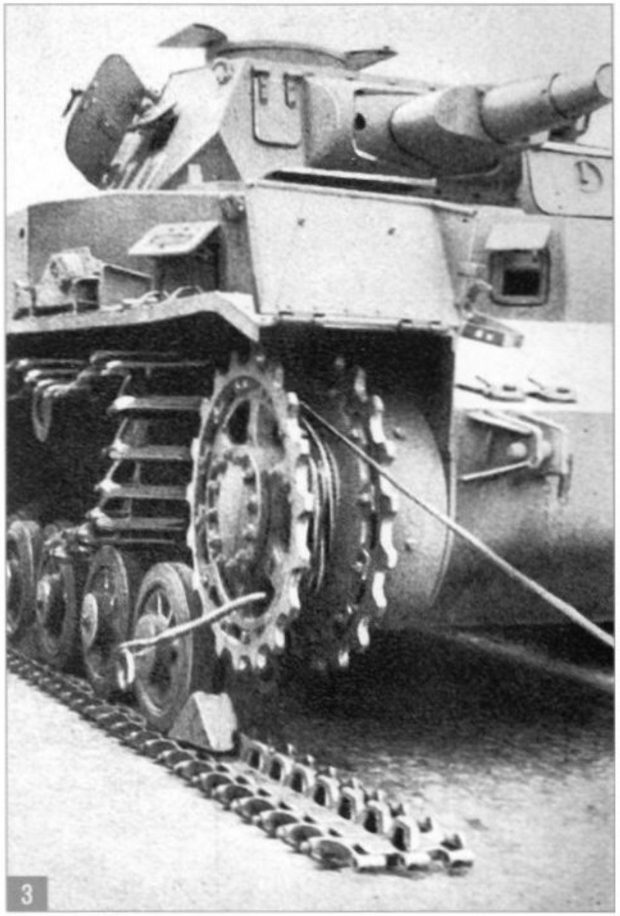
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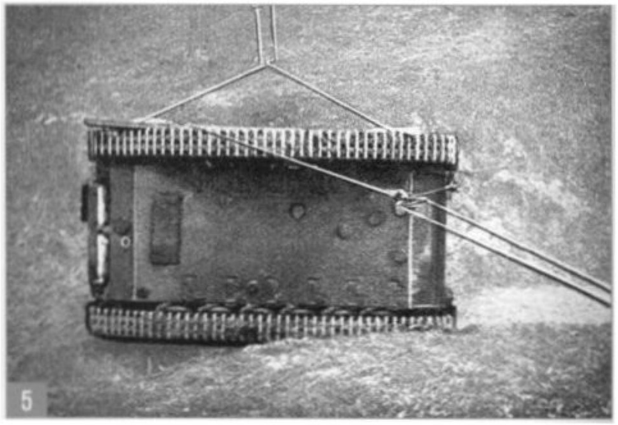
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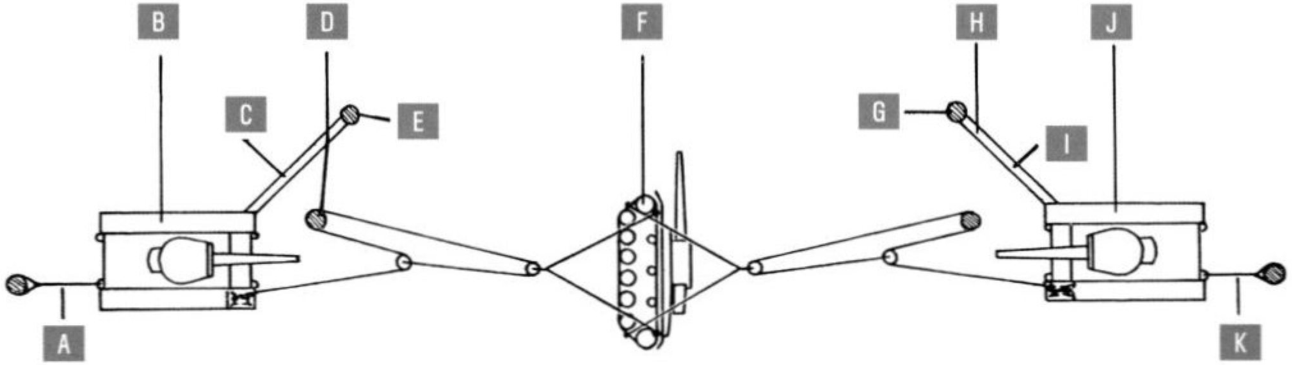
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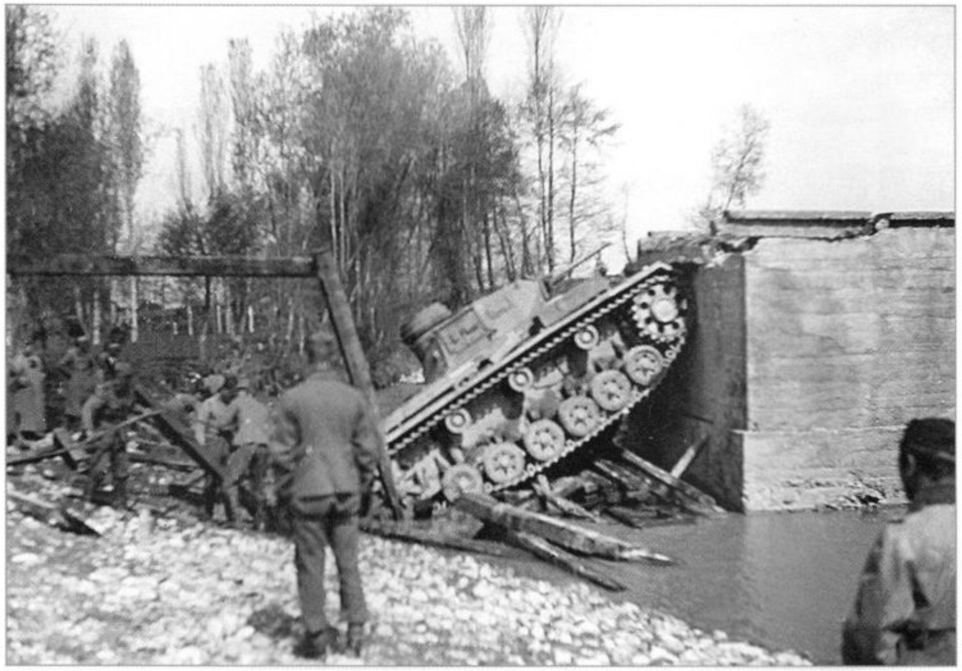
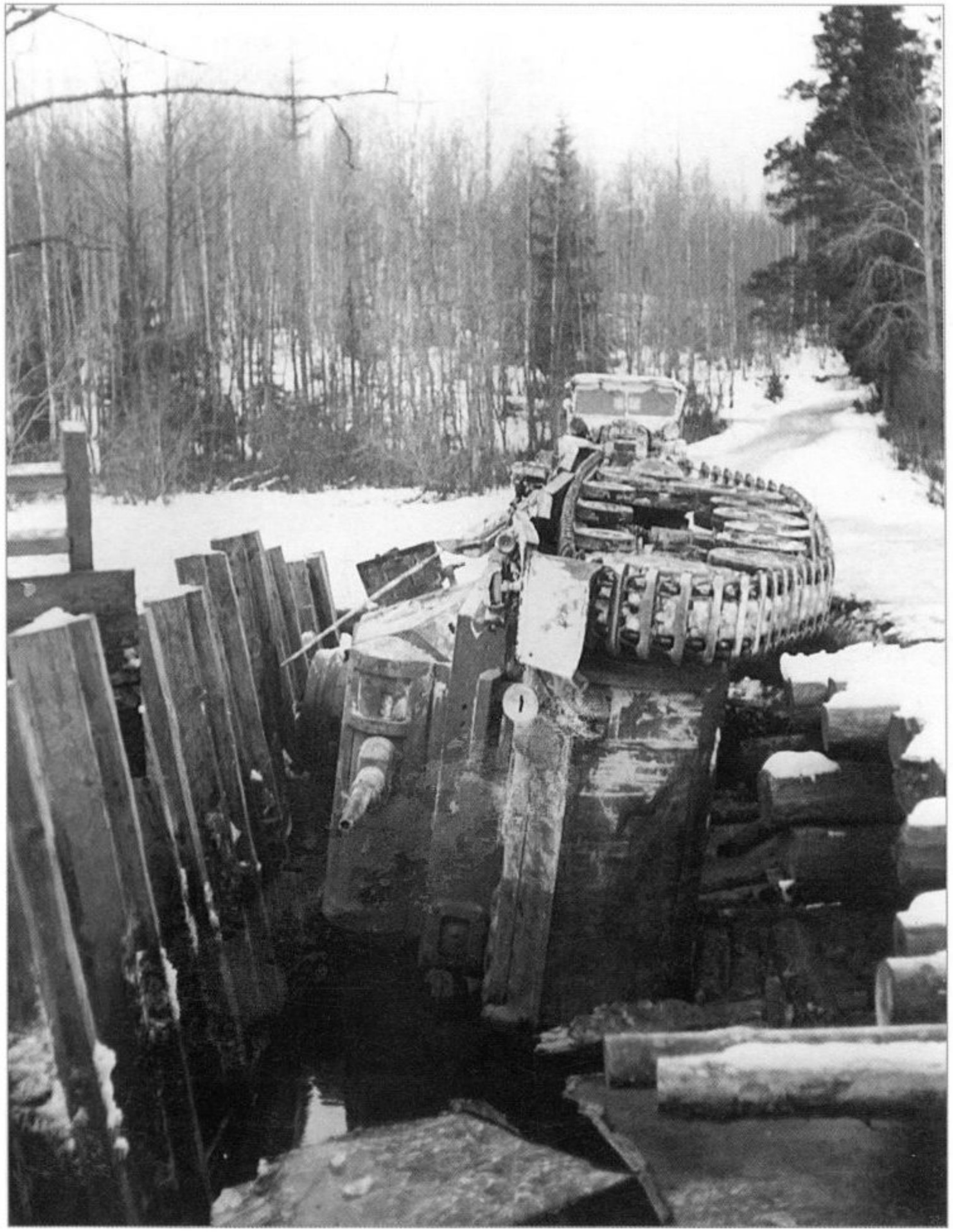


1. - 3. These photos show how the sprocket of a Panzer could be used as a winch. This was possible on all Pz.Kpfw., from Pz.Kpfw.I to the Tiger and the Pz.Kpfw.38(t). When doing so, the Panzer had to be well anchored. In (1) the Panzer is supported at the front by a log, in (2) behind by a cable.
4. - 6. Show how a Panzer weighing less than 30to is put back on its tracks again with the help of two sprockets used as winches.

A. Panzer anchored to tree.
B. Track opened, sprocket used as winch.
C. Log as support.
D. Anchoring by wrapping the cable three times around a tree.
E. Tree.
F. Overturned Panzer.
G. Tree.
H. Anchoring by wrapping the cable three times around a tree [there is a mistake as the line should go all the way to the tree as with (D)].
I. Log as support.
J. Track opened, sprocket used as winch.
K. Panzer anchored to tree.



These two photos show Panzers in unusual predicaments where the recovery troops had to use all their wits and tricks from the book to get them out. *AMC, LA*

Due to the difference of Zgkw. losses and supplies, the disproportion of actual- and target inventory continually increased. To move guns or to recover Panzers only the actually operational Zgkw. can be counted on. These percentages though are a multiple smaller than the actual inventory.

Inventory 01/01/44	Operational 01/01/44
1t = 59%	1t = 38%
3t = 77%	3t = 52%
5 and 8t = 81%	5 and 8t = 53%
12t = 62%	12t = 44%
18t = 64%	18t = 41%

The Speer minutes from 3 September 1944 listed Saur saying that 1,500 Zgkw. in need of repair were on German territory. Saur said that they needed to be repaired in a concentrated effort until 15 October 1944 and be delivered combat ready to the troops. For this, it was allowed to cannibalize severely damaged vehicles down to a total of 1,000 vehicles if it helped speeding-up making those 1,000 operational. The operation was to be led by the spare parts representative Dipl. Ing. Österreich.

On 12 October 1944 Speer noted that the Führer had been informed that with an exceptional and unique effort a total of 1,141 Zgkw. will be finished by the ordered date of 15 October 1944, namely: 302 Zgkw.1t, 424 Zgkw.3t, 91 Zgkw.5t, 196 Zgkw.8t, 57 Zgkw.12t, 71 Zgkw.18t. Another remnant of 158 Zgkw. was promised after the date.

Some captured enemy Panzers were used as recovery vehicles but only in isolated cases. Only the medium and heavy Russian tanks were attractive as recovery vehicles but not many of these were captured in good condition. Another reason why they could not be deployed in large numbers was because spare part production plants had not been captured as well.

How few Russian Panzers were captured in 1943/44 was apparent in the diary of Pz.AOK 4, Abt. V shown in Chapter Four of RtP1 and Chapter Five of RtP2. The OKH/Org.Abt. III noted on 5 November 1941, that

> *.. the thousands of captured Panzers in Russia should be made serviceable. However, many of the Panzers were so damaged in combat that they can only be used for scrap. A lot of the apparently undamaged Panzers are missing important parts, which either the Russians themselves took away, were destroyed or were taken out by our own troops. Many Russian Panzers that appear to be worth repairing weigh 40to and 52to and cannot be moved by German recovery equipment.*
>
> *The main reason why it is impossible to use the Russian Panzers is that, in the short time available, our own repair services are not sufficient to recover, repair, reissue or send back home for major overhaul our own German Panzers. Therefore up to the end of October just over 100 Russian Panzers were used for security tasks or brought in for repair. Most of the Russian Panzers that lay scattered across wide areas, estimated to be over 10,000, will lay out over the winter and thereafter will not be restorable for any use.*

On 2 June 1943, OQu Nord/V reported:

> *The OKH has assigned the repair of Beute-Panzer to Pz.Inst.K.Werk Riga. It is urgent that all recovered or repairable T-34, KW I and KW II Beute-Panzer located with units (and excess repair parts) be sent to the Pz.Inst.Gruppe North. As before, all other types of Beute-Panzer regardless of condition and their repair parts are to be sent to the 4.(Pz.)Zug/Wkst.Kp.207 in Werro.*

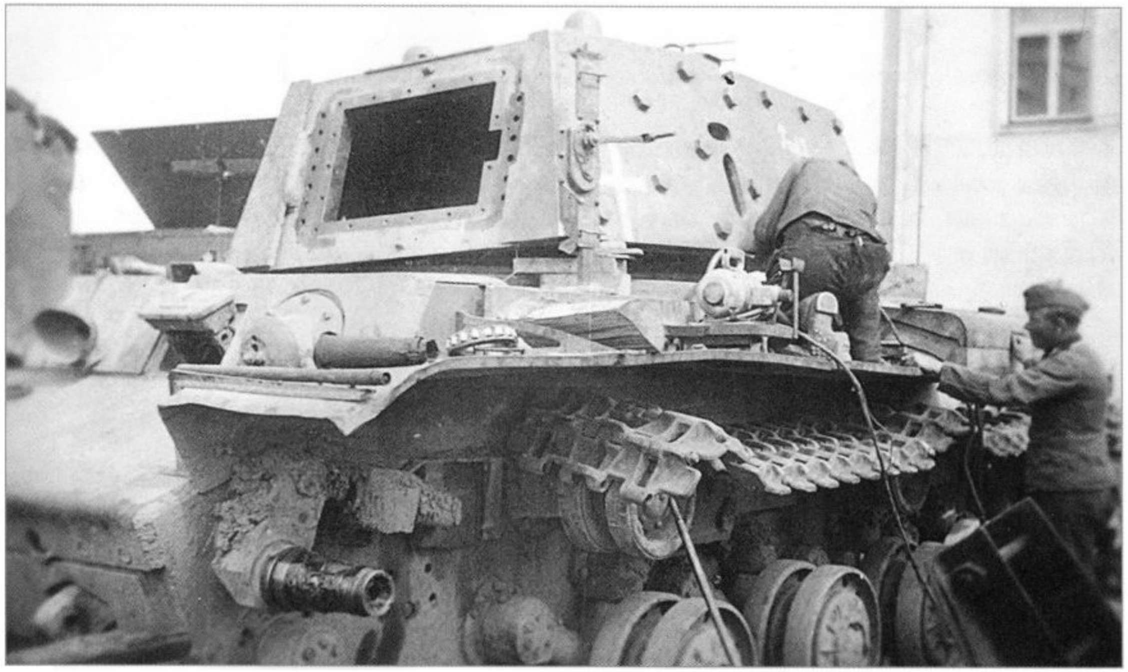
Beute-Panzer were used to create Beute-Panzer Züge/Kompanien in the rear area, to create Polizei Panzerkompanien or to strengthen regular frontline units. According to an order from OKH/GenStdH/GenQu/Abt.III, Russian KV I tanks were used by Panzer-Bergekompanie 4 to recover Tigers and Beute-Panzers in the sector of A.O.K.18 and later also A.O.K.16 as reported by H.Gr. North on 14 September 1943. The H.Gr. reported on 15 September 1943:

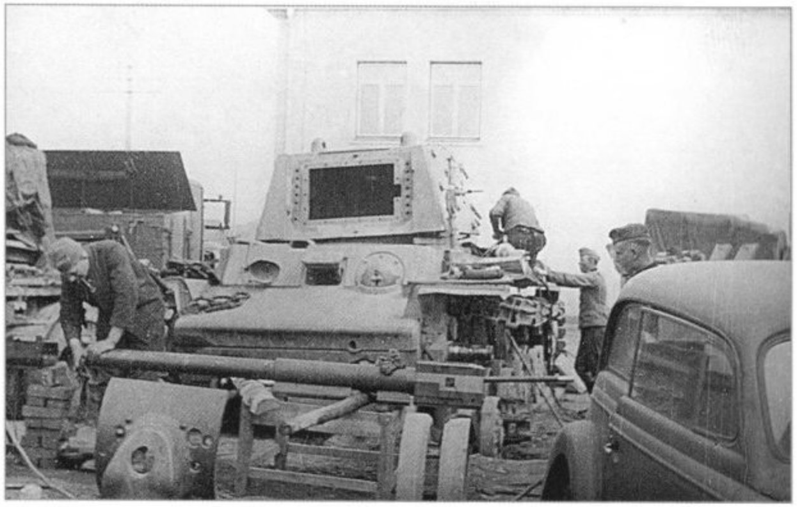
> *Based on previous experience in recovering Panzers, the OKH has*

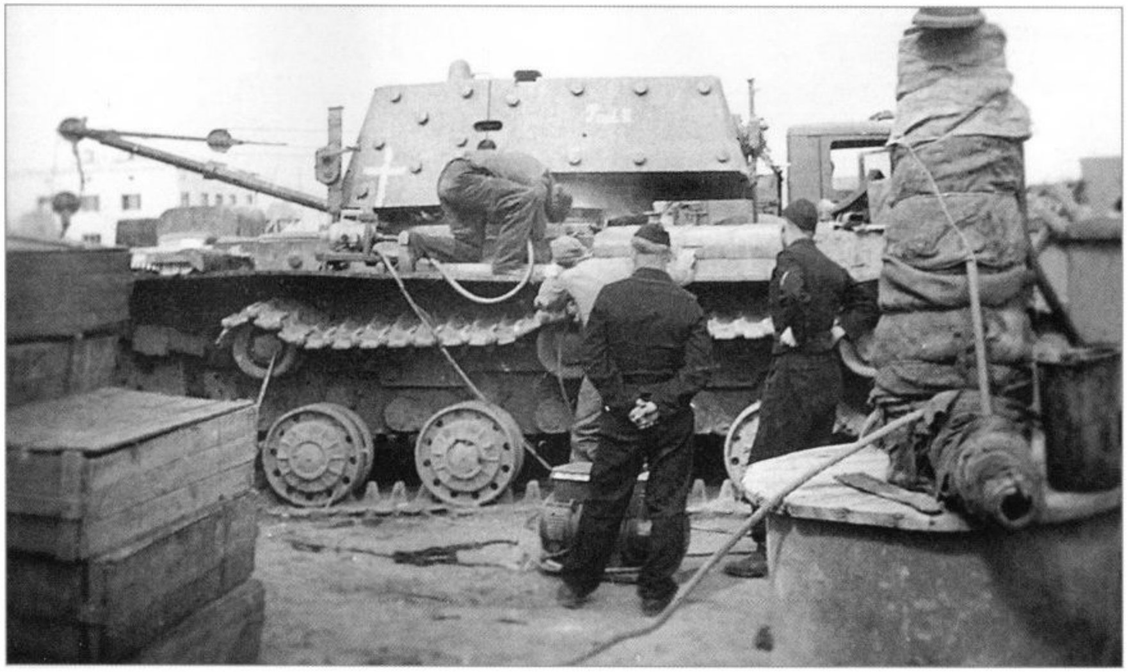
> *decided that Beute-Pz.Kpfw. KW I are to be used as Bergepanzer. When still present, the weapons, the turret and the gun are to be left in place to increase the traction weight and also to be used in defense of the 'Bergekommando'. Use of these KW I as Bergepanzer is decisive because of the shortage of equally heavy and suitable German recovery vehicles for recovering heavy Panzers. Also, it is forbidden to divert armed KW I issued as Bergepanzer to combat tasks.*

On 25 October 1943 H.Gr. North noted:

> *Initially, Russian Beute-Panzer KW I and T-34 located in the Pz.Inst.K-Werk Riga are to be rapidly outfitted as Berge-Panzer for H.Gr. Middle. Those Beute-Panzer that can still be used as fighting Panzers are to be rapidly repaired and issued as follows: all KW I to H.Gr. North and all T-34 to H.Gr. Middle to outfit Beute-Kompanien and also as Berge-Panzer.*







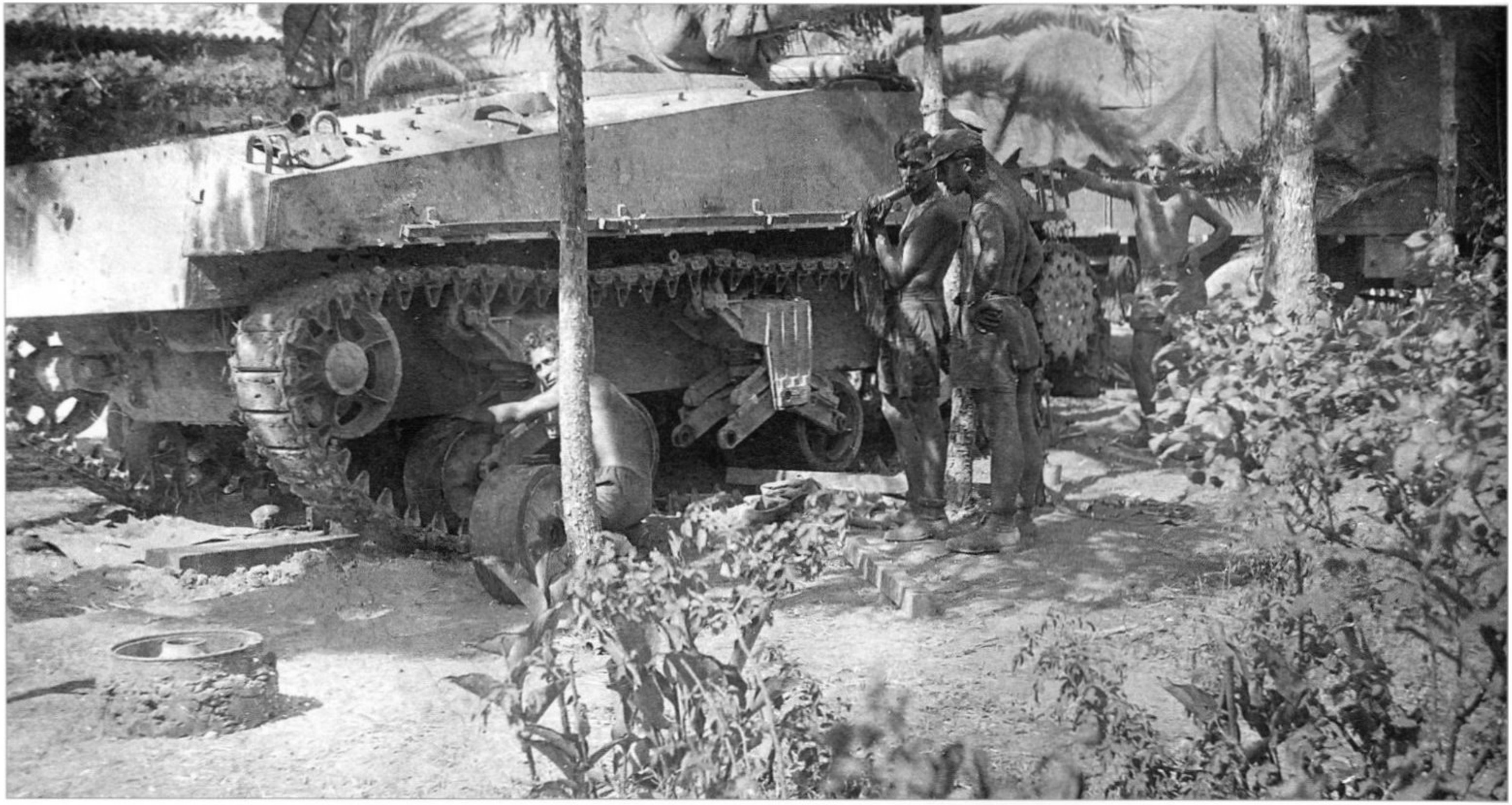
A KV-1 Mod.1940 s Ehkranami is probably made being ready for German service or being taken apart to render some other 'Beutepanzer' ready - sometime, somewhere in 1942. *AMC*

▼ Probably one of the Shermans (here an M4A2) captured in a night battle by the 3./s.Pz.Abt.508 in Italy. No markings are visible to identify its previous unit. Note the discarded road wheel. The tank retains its turret. *AMC*

Dipl.-Ing., Oberingenieur, Oberstleutnant and Kompaniechef, Curt Riegel recounts the use of their two captured Shermans:

These enemy Panzers were equipped with an escape hatch in the bottom of the hull. We saw this as advantageous to us. In many cases, the tracks of disabled Panzers had to be cut off with a welding torch. During recovery, this work naturally drew enemy fire. It seemed a good idea to install welding gear in the Shermans. We could drive right up to the track of a disabled Tiger, run the hoses through the floor hatch and cut off the track in safety. The two Panzers thus proved to be very usable recovery means, especially under enemy fire.

No. 18 of the 'Nachrichtenblatt der Pz.Tr.' from December 1944 reports of another successful use of a captured Sherman in Italy.



Gen.Qu./Abt.III on the Zgkw. spare part situation on 26Jan44:

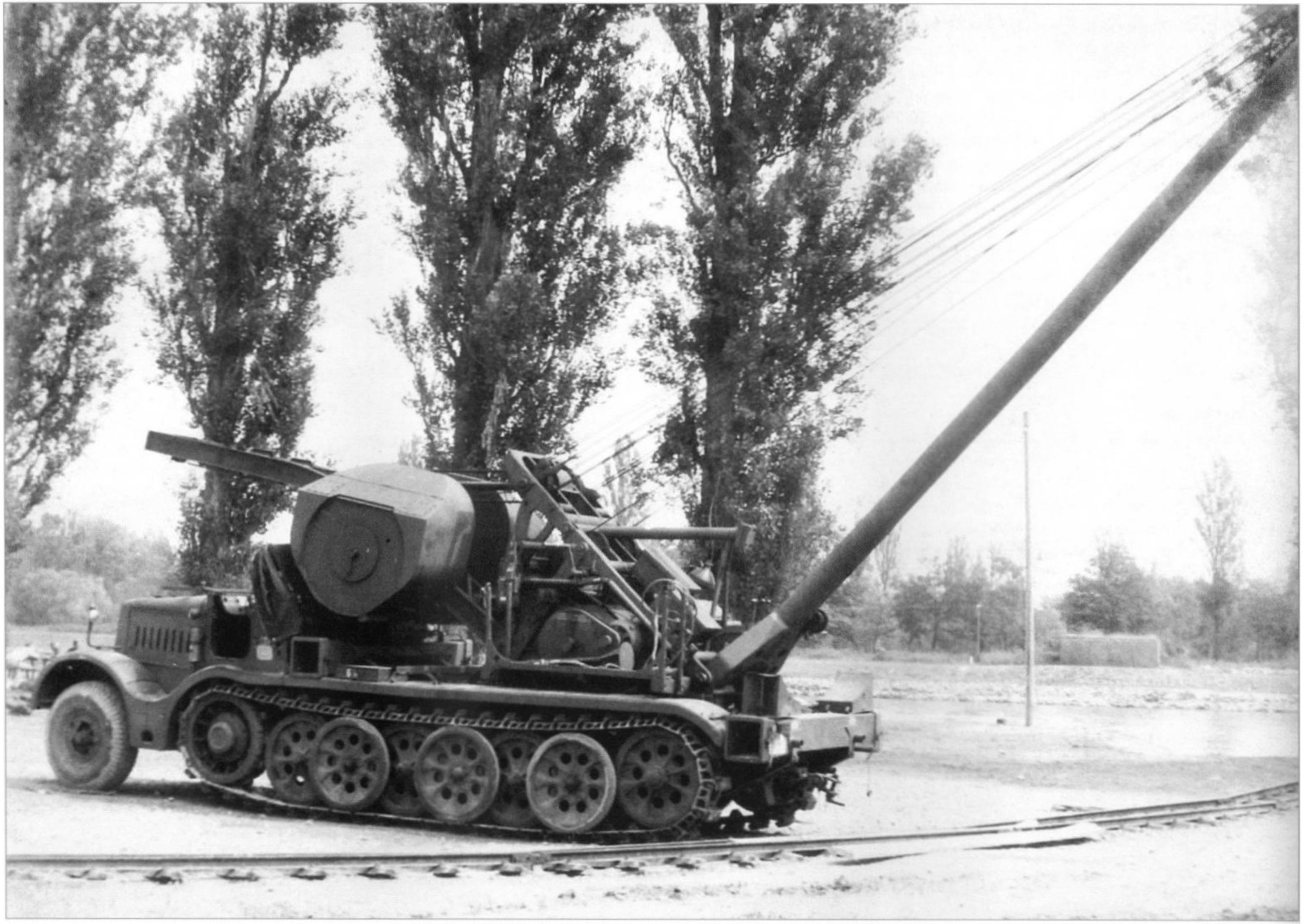
1. *Zgkw.1t: 160 Mangelteile (shortage parts) lowered to 7 'Engpassteile' (bottle neck parts).*
2. *Zgkw.3t: 274 positions requested, thereof 50 'Engpassteile'. 19% not available. Out of a monthly requirement for 255 road wheel axles only 85 (33%) can be delivered. Out of a monthly requirement of 60 front axles none were delivered.*
3. *Zgkw.8t: Out of 554 positions only 203 (37% of the Type KM m 11 and 47% including Type KM m 10 cannot be delivered).*
4. *Zgkw.12t: Because of enemy attacks on the 'Reich' the situation cannot been overseen. Noticeable spare parts delivery cannot be promised.*
5. *Zgkw.18t: Out of 596 positions, 56 cannot be delivered for the time being. 18 positions will not be available on the long term. Out of the 101 required transmissions, only 10 could be delivered in January.*

On an undated overview of the 'Sonderausschuss Zgkw. und Sd.Kfz.-Fertigung' (special panel for Zgkw. and Sd.Kfz. production) for the year 1944 and 1945 the following production numbers were listed for the Zgkw.18t and its variants. The numbers added in parentheses are from the 'Preliminary Emergency Program 1945' from WuG 6, dating 24 February 1945.

Date	Zgkw.18t	6to Kranwagen	10to Kranwagen	40to Kranwagen	Total
Jan.	55	7	...	...	62
Feb.	52	1	...	...	53
Mar.	77	6	...	...	83
Apr.	56	5	...	...	61
May	65	12	8	...	85
Jun.	85	6	3	...	94
Jul.	84	1	4	...	89
Aug.	45	12	...	...	57
Sep.	48	7	...	...	55
Oct.	38	6	3	...	47
Nov.	60	2	...	...	62
Dec.	79	7	...	...	86
Total 1944	**744**	**72**	**18**	**...**	**834**
Jan. 45	50	2	8	...	90
Feb. 45	24 (24)	2 (8)	... (5)	...	26
Mar. 45	(-)	(10)	(5)		
Apr. 45	(-)	(10)	(5)		
May 45	(-)	(7)	(5)		

▲ The WuG 6 overview stated that except the 24 Zgkw.18t in Feb45, all variants from that date and onwards came from Zgkw. chassis already produced in Jan45.

◀ This photo is from KC winner Lt. Alfred Regeniter who served with 3./StuG.Brig.276.



Vehicle Diversity

The planing, production, stocking and transporting of spare parts was strongly complicated by the enormous number of different types and makes of wheeled vehicles the German army deployed.

In Germany, the rationalization in the car industry in the 1920s had limited effects for neither the reduction of the number of car models nor the standardization of components was accomplished. They were achieved at the end of the 1930s under the pressure from the government ('Schell-Plan'), but remained without substantial results because of the outbreak of the war.

To also reduce the number of Panzer types, Speer proposed according to his minutes of 12 October 1944:

> *Completely drop the production of the class of 25to vehicles [Panzer III and IV chassis] with the goal to build those vehicles proportionally in the 38t class [not meaning 38 tons but the Czech chassis 38 (t)] and the Panther class. On 38t shall be built the Sturmgeschütz, the Aufklärer, the Flakpanzer and the Sturmhaubitze while on Panther shall be built the Panzer with 7,5 L 70 and the Sturmgeschütz with 8,8 L 71. Only the Sturmpanzer will still have to be built on Panzer IV chassis. It will be easily possible though to complete the necessary units by rebuilding vehicles sent back for repair.*
> *This measure should [among others]*
> - *Make the manufacturing less sensitive to crisis because more manufacturers are working on just one type,*
> - *Simplification of spare parts supply,*
> - *Production of the HL 120 engine could be stopped and all these newly available means could be reorganized in producing the 12 cylinder air cooled Tatra diesel engine.*

◀ A rare sight: The Drehkran (10t) auf Fahrgestell des s.Zgkw.18t (Sd.Kfz.9/2). It was listed in the K.St.N. 1185a, 10 January 1943, for the Panzerwerkstattzug 'Panther' but could be replaced by a Sd.Kfz.9/1; it and did not show up again in later K.St.N.s. *AMC*

The late proposition by Speer to increase Panzer production by focusing production on just the Panzer 38(t) and Pz.Kpfw.V was never carried out. Even though the reduction of Panzer models would have had certain advantages, the variety of Panzers did not begin to approach the variety of wheeled vehicles. According to Luckner, all Kfz. of the army, the air force, the navy and the administrations in the homeland were officially counted as of 1 January 1943. The calculation gave a stock of 1.2 million motor vehicles with approximately 2,200 different types (of which half were German and half were foreign made).

On 3 November 1941 the 18.Panzerdivision reported no less than 96 different types of cars, 111 types of trucks and 37 types of motorcycles.

Another example of the number of vehicle types in a division was found in the Speer minutes of 28 June 1943 about a meeting two days prior:

> *The Führer understands that - as established - a division has 110 different motor vehicle types, but it must be possible that the supply from the homeland is organized in a way that no further types are added. The inspected division in question first had 95 different types. The number was increased by 15 to 110 by supplying 30 repair vehicles.*

Over a hundred different types in only a single division was not an excessive example as the following diary entry shows. Halder noted on 22 May 1941 General Buhle saying that the 17.Panzerdivision had 240 different types of vehicles.

The 4.Panzerdivision had even more different types. It reported the following inventory of wheeled vehicles for August 1943:

	Krad	Pkw	Lkw	Total
Total	344	519	1470	**2336**
Year of Production 1934-8	72%	23%	38%	**63%**
Number of Types	38	86	156	**280**
Each type appearing:				
less than 10 times	30	73	117	**210**
less than 5 times	21	62	104	**187**
only 1 time	11	39	57	**107**
Foreign Fabrication	2%	8%	34%	**23%**
Russian Fabrication	...	2%	18%	**11%**

It is remarkable that the division not only possessed a large number of different vehicles, of which many were only present in very small numbers, but also that a large part of the wheeled vehicles had already seen four years of combat and were obsolete and weary. The number of vehicles under maintenance together with the total losses had reached a total of 40%.

▼ This is a Tatra T 27 with the same Billstein crane as shown on page 192 helping to resolve a traffic jam. *VR*

The I./Pz.Rgt.36 assigned to Pz.Brig.10 reported on 1. August 1944 66 Panzer V. It had not yet been assigned its wheeled vehicles, but at the moment it had 28 Lkw, 23 Pkw and 8 motorcycles, all together 18 different types! The vehicles were only suited for limited deployment on the Western front and not at all for the Eastern front. See the appendix for another, extra detailed example of the variety of vehicles a Panzerdivision contended with in 1942.

At an early stage, it was realized that the large variety of vehicle types in Germany negatively influence the overall productivity for a future war. Therefore in November 1938 Adolf von Schell as 'Generalbevollmächtigter für das Kraftfahrwesen' (chief representative of the automotive section) was ordered to create a plan for the limitation of types. That plan was presented in March 1939. The 113 Lkw types should be reduced to approximately 19 and the 52 Pkw types to 30. The Schell-Plan became effective on 1 January 1940. Industry should reorganize their production in 1939 so that the cancelled types would run out in 1940. Four base types of Lkw were proposed for production: 1,5to, 3to, 4,5to and 6,5to. Per manufacturer, at maximum two types should be granted.

However, the so called 'Schell-Plan' only partially became reality. The production of motorcycles and Pkw was greatly limited to support the production of Lkw. Some types which were not part of the Schell-Plan were continued as well. In addition, the quick and rushed expansion of the Wehrmacht made it necessary that every motor vehicle that could be gotten hold of was confiscated. This included up to 50% of the Lkw of the German economy and of course an endless number of vehicles in the occupied territories. Many manufacturers in the occupied countries kept producing large quantities of all kinds of vehicles for the Wehrmacht. Even though some attempts were made to concentrate foreign equipment in certain units, the effect remained imperceptible. That type simplification was sacrificed in favor of high production numbers is backed-up by a memo of Speer's from 8 August 1943 and officially communicated to Gen.Inst.d.Pz.Tr, Gen. Qu. and others on 18 August 1943:

Because of the extremely tight transport situation, the vehicle

> *production must be increased by using all available capacities. Measures for type simplification are only permitted as far as they directly serve to increase production.*

The 'Schell-Plan' was also compromised by particular interests. Hiroyuki Okamuro wrote in his paper 'From Exit to Voice: the Evolution of the Supplier Relationship in the German and the Japanese Automobile Industries' (27Jul04): "The delegate from Daimler-Benz, Oberbaurat Fritz Schmidt, played a crucial role in the standardization process as the chairman of the extended meetings of the Technical Committee. As a result of his efforts, Daimler-Benz could maintain almost the same product lines as it was for both cars and trucks, despite the drastic reduction in the number of varieties" (DaimlerChrysler Archive, collection Kissel 9.31, memo from director Sailer on 4Oct40 about standardization).

The more different vehicles there were to service, the larger the I-Dienste had to be and the more transport capacity was necessary to bring along the spare parts. The I-Dienste also suffered under the truck shortage which in turn again influenced the vehicle situation. For example, at one point the I-Staffel of the Panzer-Artillerie-Abteilung 103 possessed only two instead of ten trucks. It is understood that this shortage then affected the operational readiness of all other vehicles negatively.

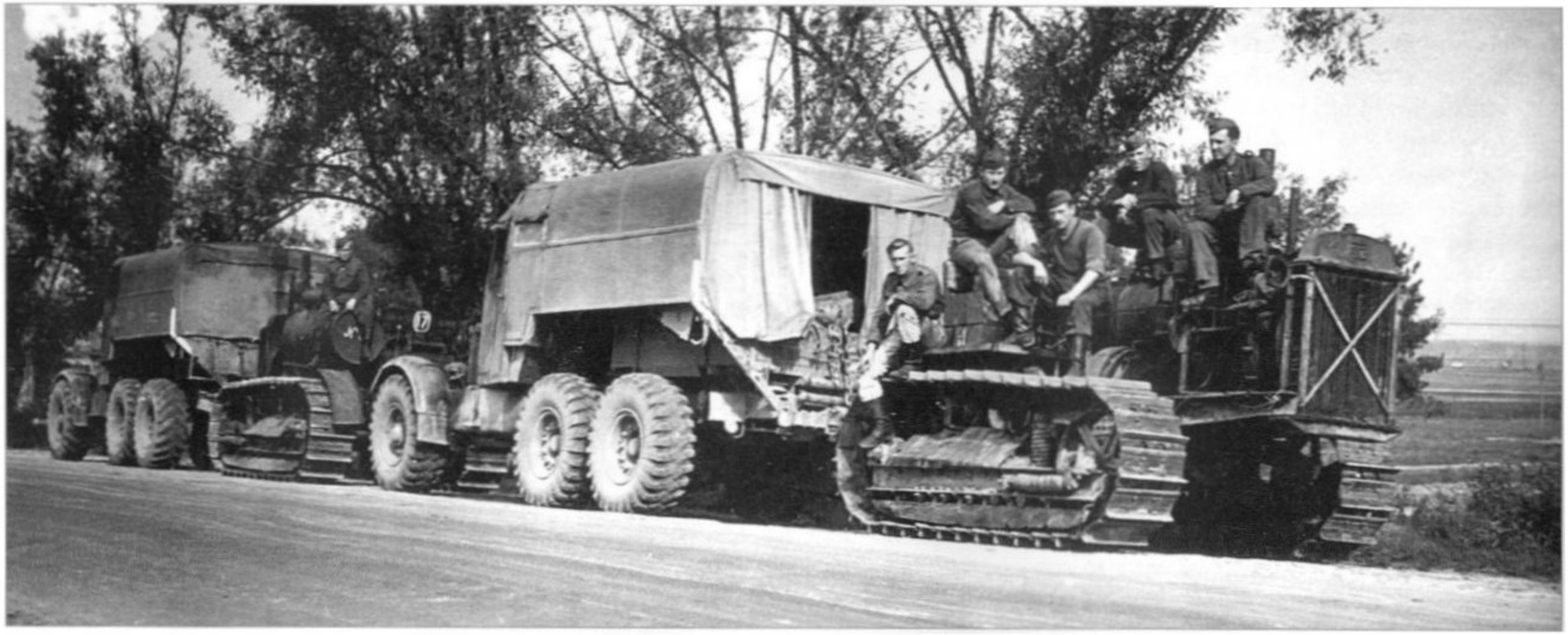
Some vehicle types were declared 'Sperrtypen-Kfz' (blocked vehicle types) and pulled out of action. The order for the Kraftfahrtruppe No. 13/44 from Kdr.d.K. with Pz.AOK 4 from 21 May 1944 gives more details on that subject:

> *Blocked vehicle types ('Sperrtypen-Kfz')*
> *Blocked vehicle types in need of maintenance are only to be repaired when this is possible with the spare parts at hand (with the troops or at the E-Staffeln or ZEL). Otherwise such vehicles have to be evacuated to the homeland through the Kraftfahrpark organization. In the zone of the Armee this is A.K.P. 538 and Kfz. Inst.Park 635.*
>
> *a) Vehicles of the blocked types of German fabrication including Zgkw go to the Wehrkreis VIII to K.P. Breslau,*
> *b) Vehicles of the blocked types of Czech fabrication go to the Wehrkreis Boehmen and Mähren to K.P. Prag,*
> *c) Vehicles of the blocked types of Russian fabrication go to the Wehrkreis IV to K.P.(S) Wittenberg,*
> *d) All other vehicles of the blocked types of foreign fabrication go to the Wehrkreis IV to K.P. Leipzig,*
> *e) Zgkw. of foreign fabrication go to K.P.(S) Wittenberg.*

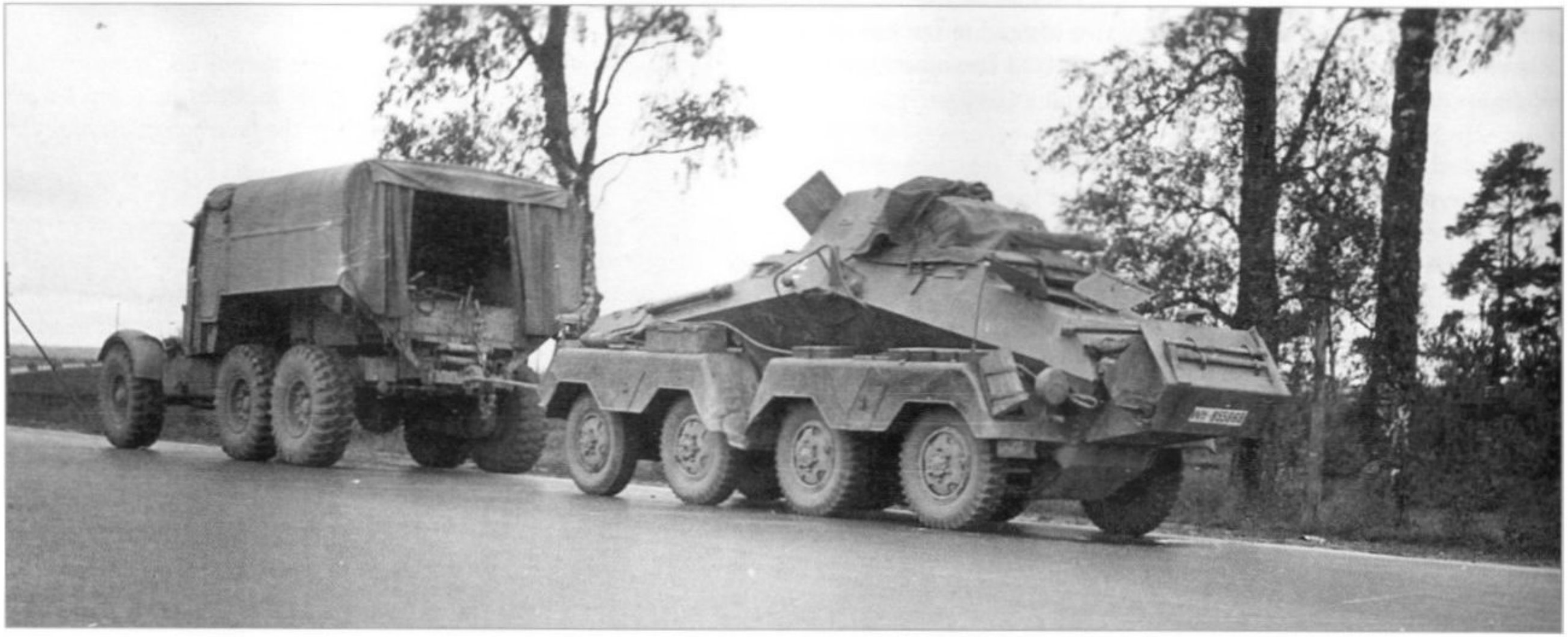
In the official journal 'Kraftfahrzeughandwerk' (see page 22), the Chef Inst./Abt.E published an article on 15 November 1944 about the interchangeability of Kfz. spare parts and stated:

> *The current situation forces us to use all means available to increase Kfz. repair performance. One of those means is to use spare parts of different vehicle types. In practice this has already been done. Many parts of foreign makes are exchanged either in their original state or with slight modifications. Even though such repairs did not meet the technical requirements of the manufacturer or the loading conditions, the method achieved its goal: the vehicle could be put to use again!*
>
> *This resourcefulness that the troops have already displayed on their own is now being followed by all repair facilities as a temporary solution. Only practical experience from the field can guarantee the same success in the homeland.*

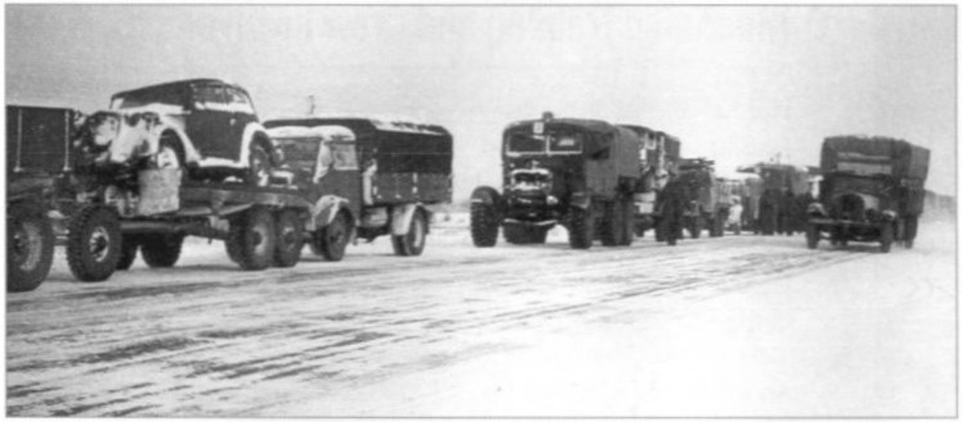
The Chef Inst./Abt.E planned to publish and widely distribute data sheets per vehicle type and year of manufacture that listed individual parts and what foreign parts they could be replaced by. An example was given: The camshaft drive chain of a Bedford truck typ XYZ built in 1939 could be substituted for a chain for a Krad NSU Typ OSL 601, Lkw Daimler-Benz Typ L 1500 or a Krad Zündapp Typ K600. Also listed was the particular unit that reported the compatibility. So that everyone engaged in Kfz. repair could share his knowledge, the Chef Inst./Abt.E planned to publish and widely distribute these cross references. The proposed substitutions were adopted without retesting.

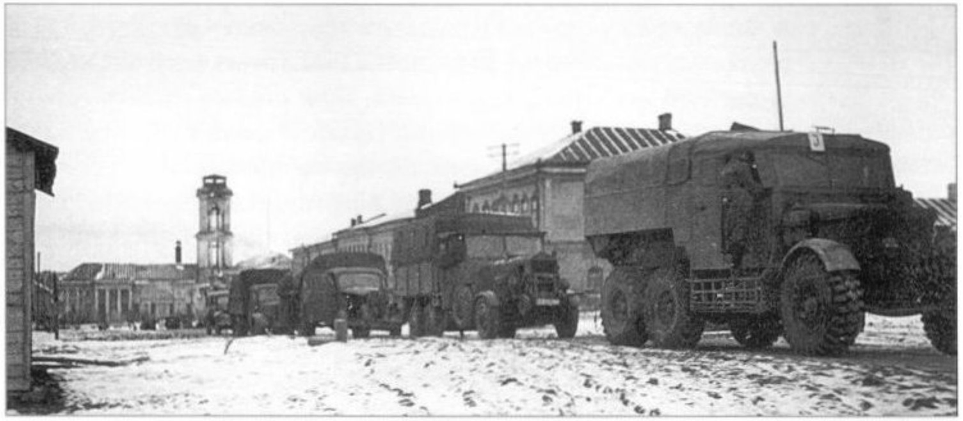


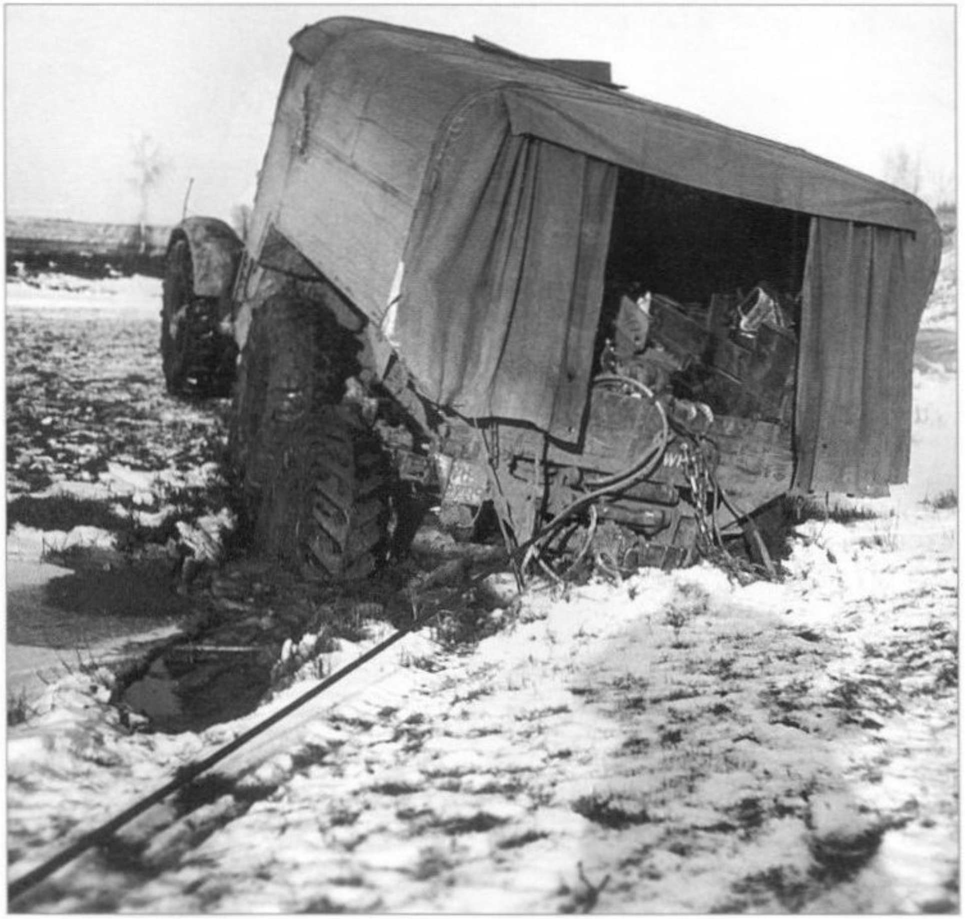
▶ Who is towing whom? The following series of photos are from a unit that employed captured British Scammell Pioneer R100. *PD*



▶ A Sd.Kfz.231 (8-rad) with 'Ersatz Panzerung' on the nose gets a tow from a Scammell Pioneer. *PD*







◀ 768 Scammells were produced beginning in 1937. Its original purpose was to be an artillery tractor for heavy guns. The Germans liked it mainly as a recovery vehicle. Note the plaque with the J marking. All other trucks and cars in the photos are of different models. In the top left photo is an Opel Olymipa on the trailer and partly hidden is an English Commer brand truck. *PD*

▲ The Scammell had a 6x4 drive and was powered by a 6-cyl diesel delivering 102bhp. It weighed 8,442kg. *PD*

▲ A 8,8cm Pak 43 Sfl.IVb Hornisse. Some of its initial flaws were the external travel lock and the low ammunition capacity. *AMC*

Also in the area of rubber, the variety of types made itself disturbingly noticeable. Schell noted in 1942 that 131 different tire sizes had to be kept available. He did not indicate to what point in the war that number applies but whether it is September 1939 or September 1942 does not invalidate the example.

Mechanic Training and Crew Involvement

Finding enough qualified specialists who also had experience had been a problem since the beginning of the war. Older and thus more experienced personnel were deployed in the Werkstattkompanien while younger soldiers, who often had not finished their apprenticeships as car mechanics yet, were deployed in the I-Gruppen.

An officer who visited several divisions equipped with l.F.H. (Sfl.-Wespe) requested on 1 September 1943 that education of the drivers and Panzerwarte be concentrated in special schools in the homeland because the education within the replacement and training units was insufficient due to the lack of training vehicles, gasoline and teaching staff. The formation would for this accept to temporarily receive four to five fewer vehicles per Abteilung if those were delivered to these schools, since a proper and thorough education of the Panzer driver and Panzerwarte would totally make up for the then lower break-down of Panzers.

In many reports from the frontline troops, the authors complain about the technical state of training of the drivers (in large parts concerning motorcycle and truck drivers) and demand that the drivers must be able to repair minor damage themselves. The fact that crews were responsible for maintenance halt checks did not mean they were responsible for repair work.

A German driver of a Pz.Kpfw. Panther from I./Pz.Rgt.6, taken prisoner in Normandy in 1944, stated that drivers were not allowed to perform even minor repair work. Their job was driving, general maintenance and control of the tracks. It can be assumed that these restrictions were based on the complexity of the Panther and the more than insufficient training of the drivers at that point in the war. He further said that a member of the I.Abt. took part in a six week training course in Erlangen. Most of the time the 15 Panthers were undergoing repairs and thus the training was mainly theoretical. In the first three weeks he did not even come close to a Panzer. By the end of the course every driver only drove the

Panther twice.

Kurt Hirlinger, a gunner and loader of the 2./s.Pz.Abt.508 remembered in 2004:

> *The Tiger gave us a lot of work, especially the suspension. Torsion bars broke, the track climbed on the sprocket teeth when driving backwards etc. When something like that occurred, we started dismounting the wheels and the tracks, to be able to exchange a torsion bar for example. For engine trouble we needed the 'I-Staffel' [sic].*

On a inspection prior to 2 December 1943, the Gen.Insp.d.Pz.Tr. Guderian, "noticed with surprise" that Panzer crews who were sent with their Panzers to the Panzer-Instandsetzungs-K-Werk were not involved in maintenance. He requested that the crews be assigned to maintenance duty in order to speed up maintenance. The same has to apply to Panzers that are repaired at Panzer-Instandsetzungs-Abteilungen. But the order for the Kraftfahrtruppe No. 4/44 from Kdr.d.K. at Pz. AOK 4 from 18 February 1944 stated:

> *Sending Escorts with Repair-Vehicles*
> *There is reason to point out that according to H.V.Bl.1943 Part B section 277, drivers must not stay longer than five days with their repair-vehicles and then must return to the responsible units.*

The order further indicated that crew members could be commanded to pick-up spare parts. However, this must be an exception.

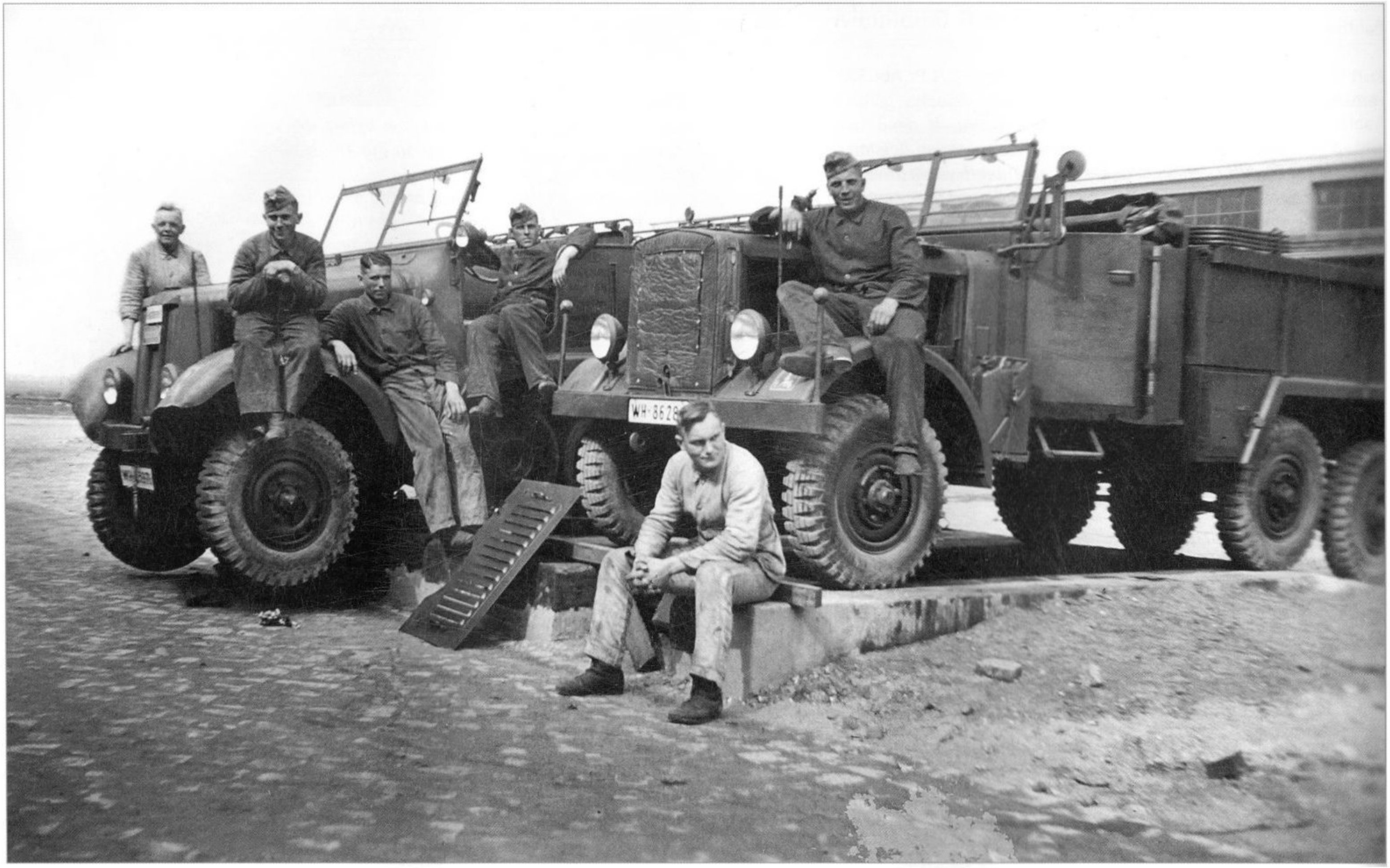
Another report that mentions the training standard of the crews was given by s.Pzj.Abt.560 on 9 June 1943. As with many other reports from the second half of the war, it alluded to the fact that the brand new vehicles were delivered in a faulty condition and as a result broke-down on their way from the rail station to the unit.

1. *The Abteilung reports that 12 Hornissen missing from the target inventory have arrived with their crews.*
2. *The crews make a good soldierly impression but their qualification is insufficient. Their training time was five days. Further training for 14 days is necessary. The gunners have fired two shots. The drivers were trained on Panzer II and III and only took over the Hornissen two days before they left. The radio operators have no training on the intercom and radios.*
3. *The vehicles show the same flaws as the first ones. All steering brakes are badly adjusted, which resulted in overheating of most of the engines. On the 17km long way that took three hours, five out of 12 new vehicles reached their destination. Seven vehicles broke down along the way and needed to be repaired on the spot, three had to be towed. [Ten vehicles reached temperatures of over 100 degrees and had to keep taking breaks to cool down.] This is proof that the vehicles leave the firms in totally deficient condition. All vehicles need to be overhauled in the Wkst. of the troops. Vehicle No. 310 033 broke its drive shaft. In the engine of vehicle Nr 310 092 a bearing drained off. The superstructure of vehicle Nr 310 068, 310 084 and 310 087 cracked. The vehicle Nr 310 085 cannot be steered while driving backwards, its radio and intercom are defective.*

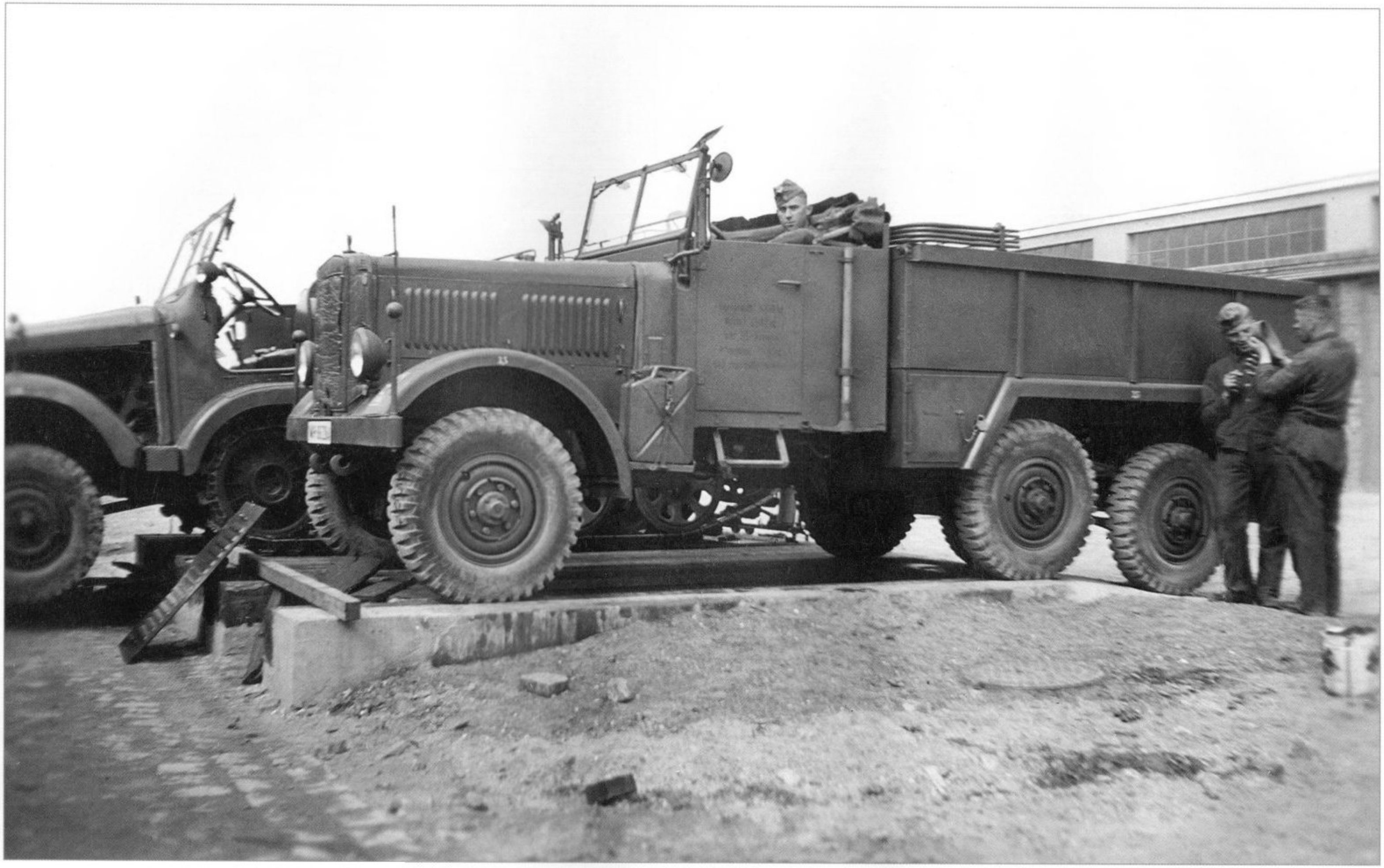
> *In expectation of such malfunctions the Abteilung sent three officers and 12 drivers to the rail station to prevent damage to the vehicle. All the same this was not achieved.*

Another example illustrating that newly manufactured Panzers did not arrive in perfect condition and needed to be checked is given by the Abteilung's engineer of s.Pz.Abt.501 in February 1943:

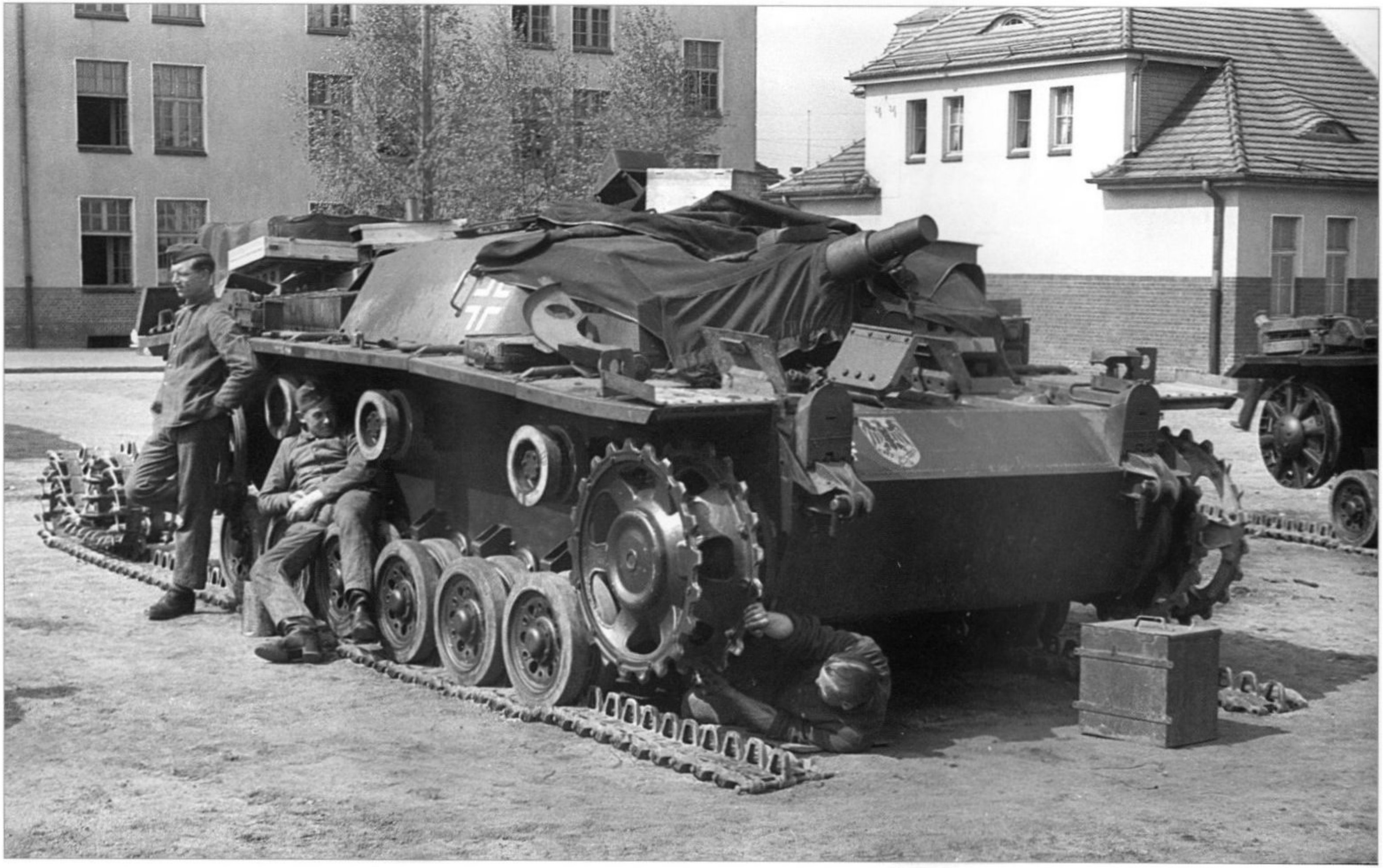
> *In reality, only a maximum of six Panzers (out of the nine newly arrived Tigers) of 2.Kompanie could be deployed, because the others just had arrived in Tunisia and suffered, as reported, from all the problems from their assembly at the assembly plant (disengaged brackets for the cool water pipes, burnt oil pipes for the radiators, leaking drive trains, dirty valves, sliding clutch disks, jammed throttle linkage etc.). Plus there are additional problems still resulting from sea transport.*



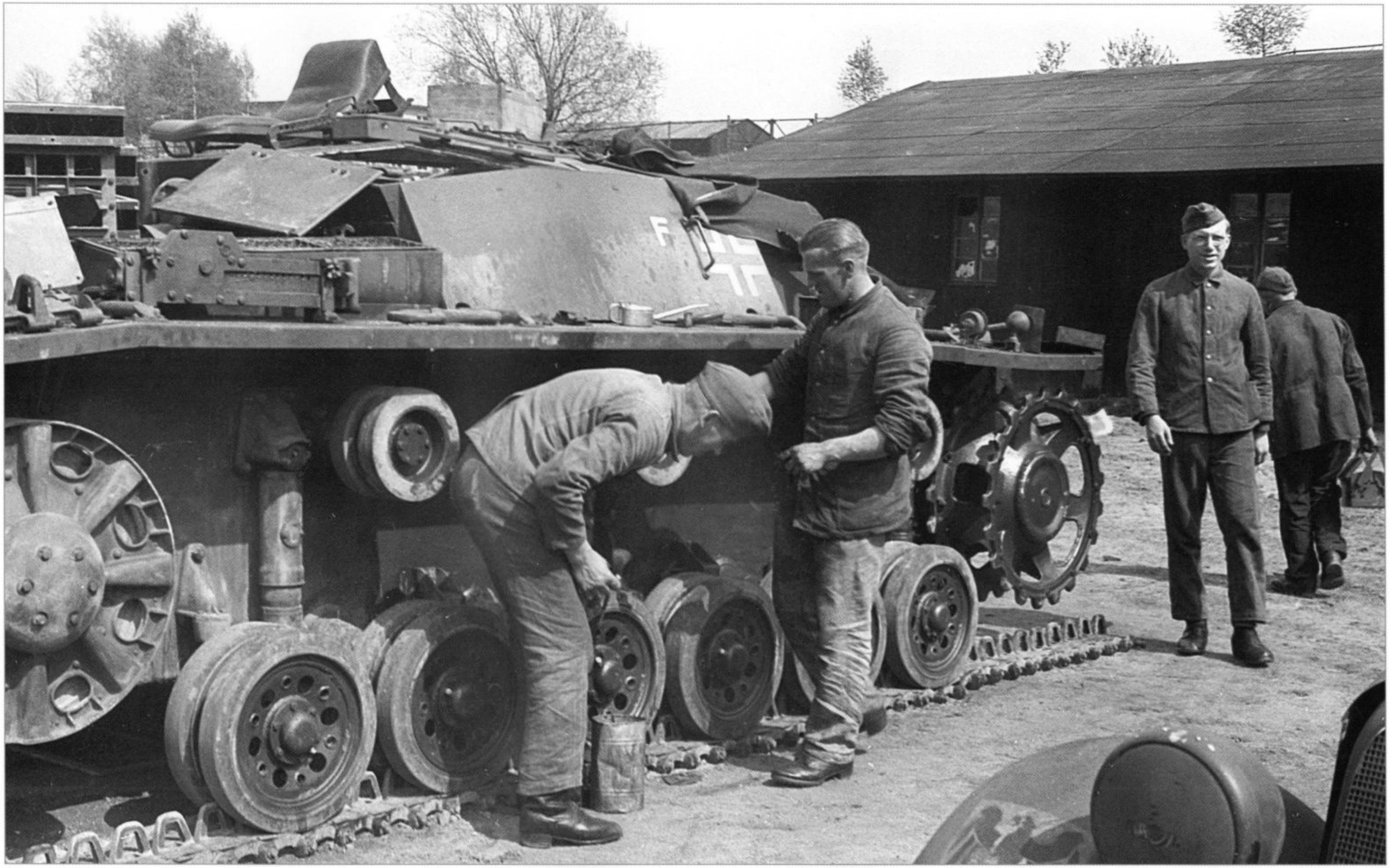
▲ Troops in the homeland had many amenities not found in the field, such as hard stands and indoor maintenance bays. The m.Zgkw.5t (Sd.Kfz.6) in the background has placards normally seen on Fahrschule vehicles. *WA*



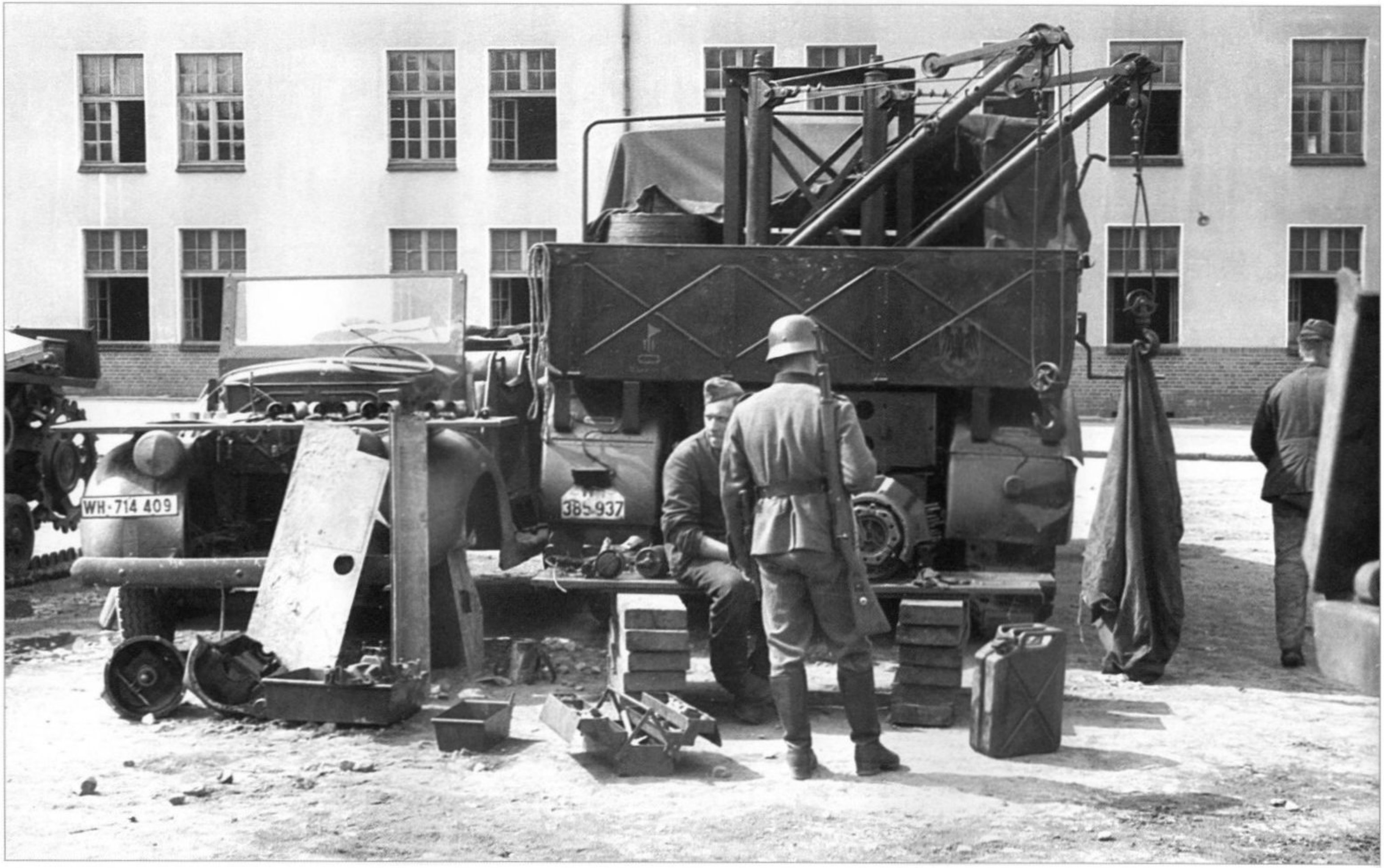
▲ The radiator on this Einheitsfahrgestell für le.Lkw has been fitted with a 'Kühlerschutzhaube' not normally seen until temperatures drop. It may be that the troops are winterizing their vehicles in preparation for deployment to the East. *WA*



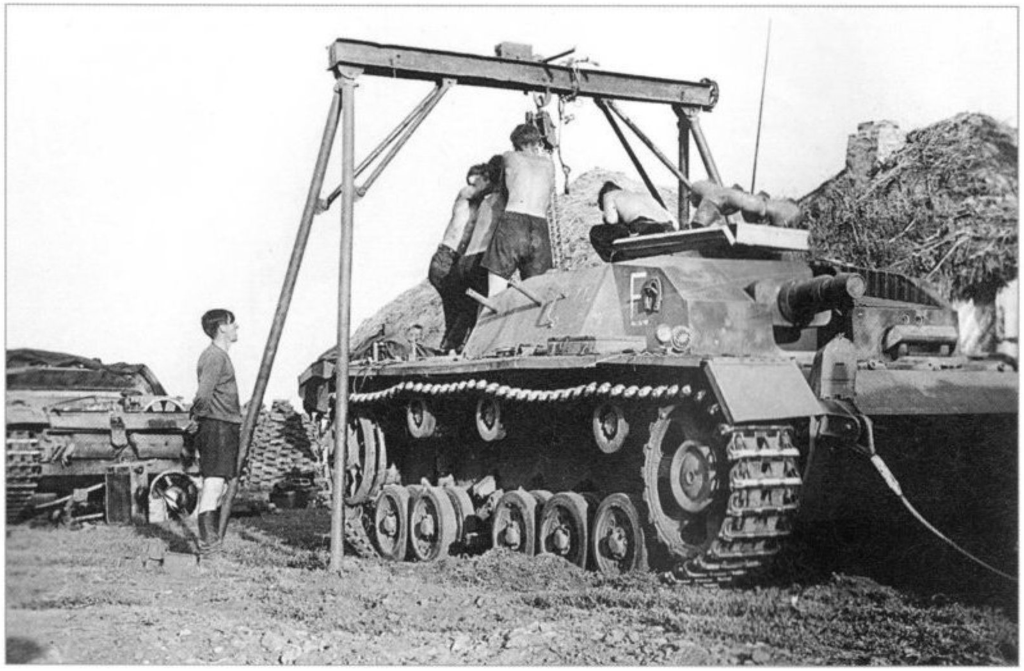
▲ Sturmgeschütz maintenance under peace time conditions. Notice the dark color of whatever they are applying, even compared to the rubber of the road wheels and return rollers. The following photos show vehicles of StuG.Abt.197. *JH*

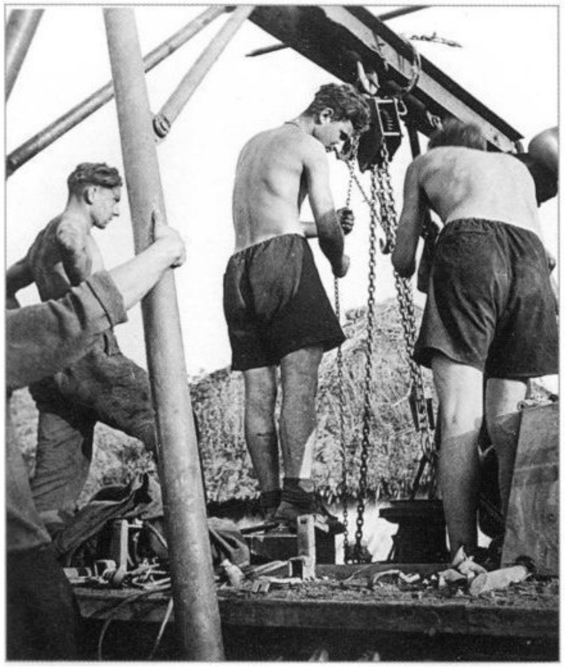


▲ The 'F' Geschütz (gun) is carrying a different type of jack than its neighboring Sturmgeschütz, which has one of the standard 'Westfalen-Winde' that German tanks carried. *JH*

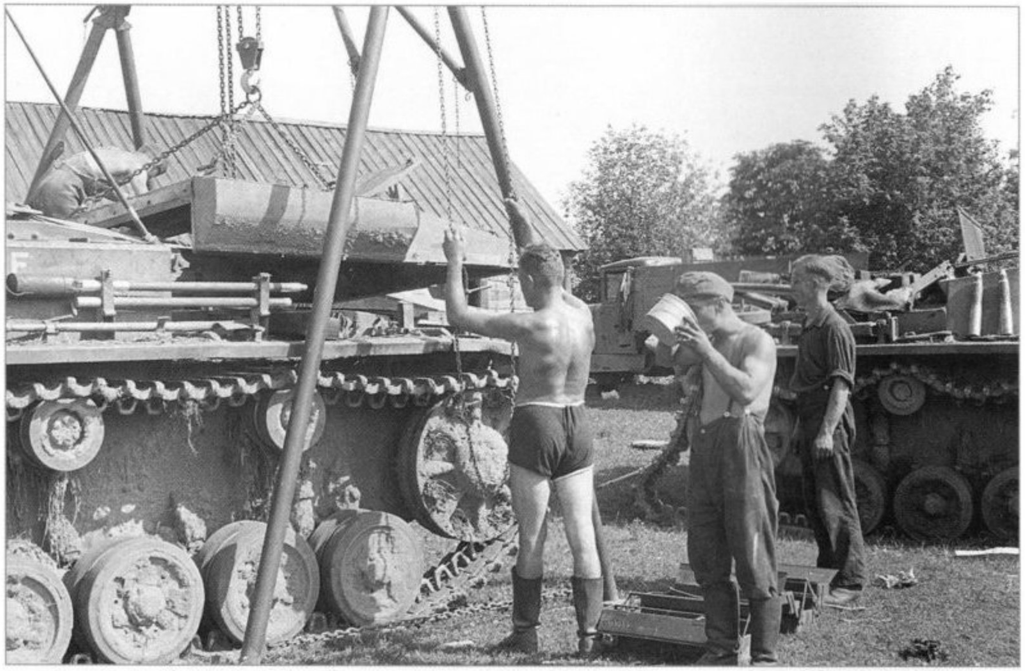


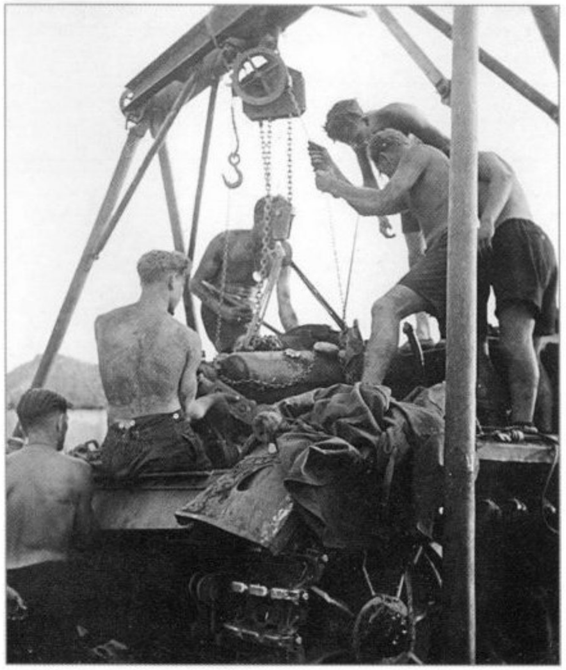
▲ Another Bilstein crane mounted on a Zgkw.18t. StuG.Abt.197 probably had at least two such vehicles since the one shown on page 192 has the license plate number 385 938 while this one ends in 937. *JH*



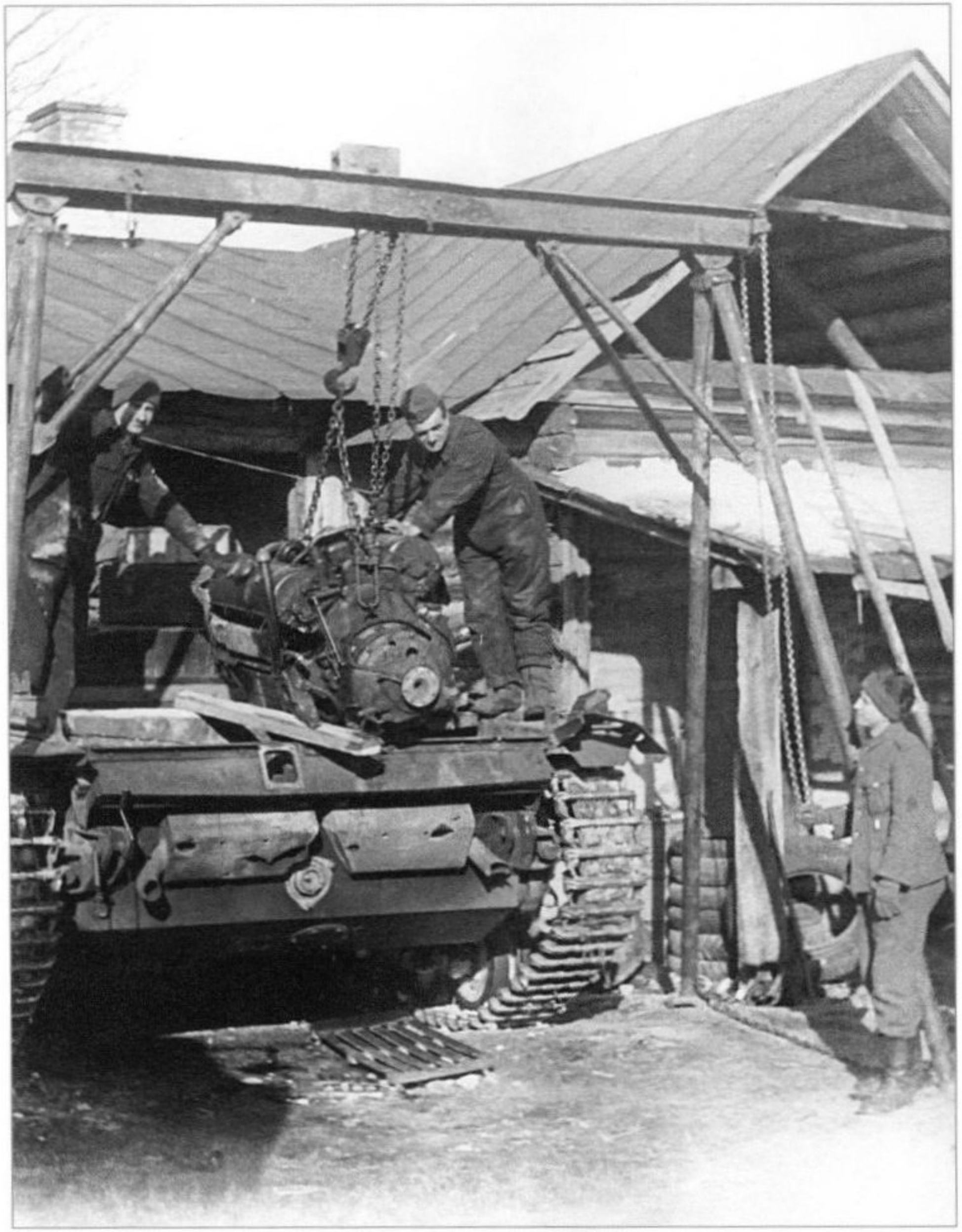


◀ The 'E' Geschütz with a horse shoe for luck but one missing road wheel. Two holders for spare road wheels have been welded to the side of the superstructure of this StuG. Ausf.A or B. The original crane hoist has broken so the mechanics are using a different hoist attached to the old frame. *JH*

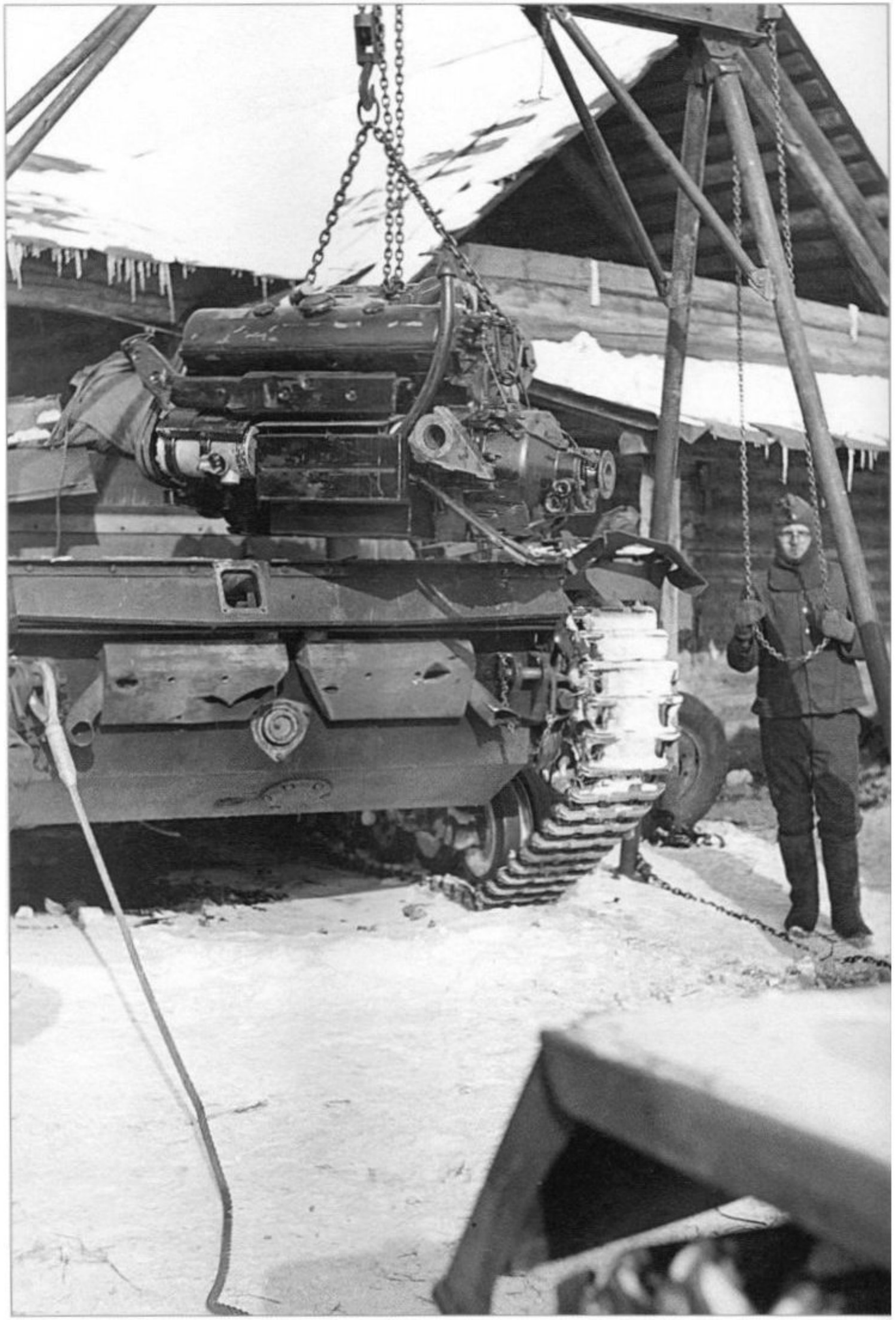


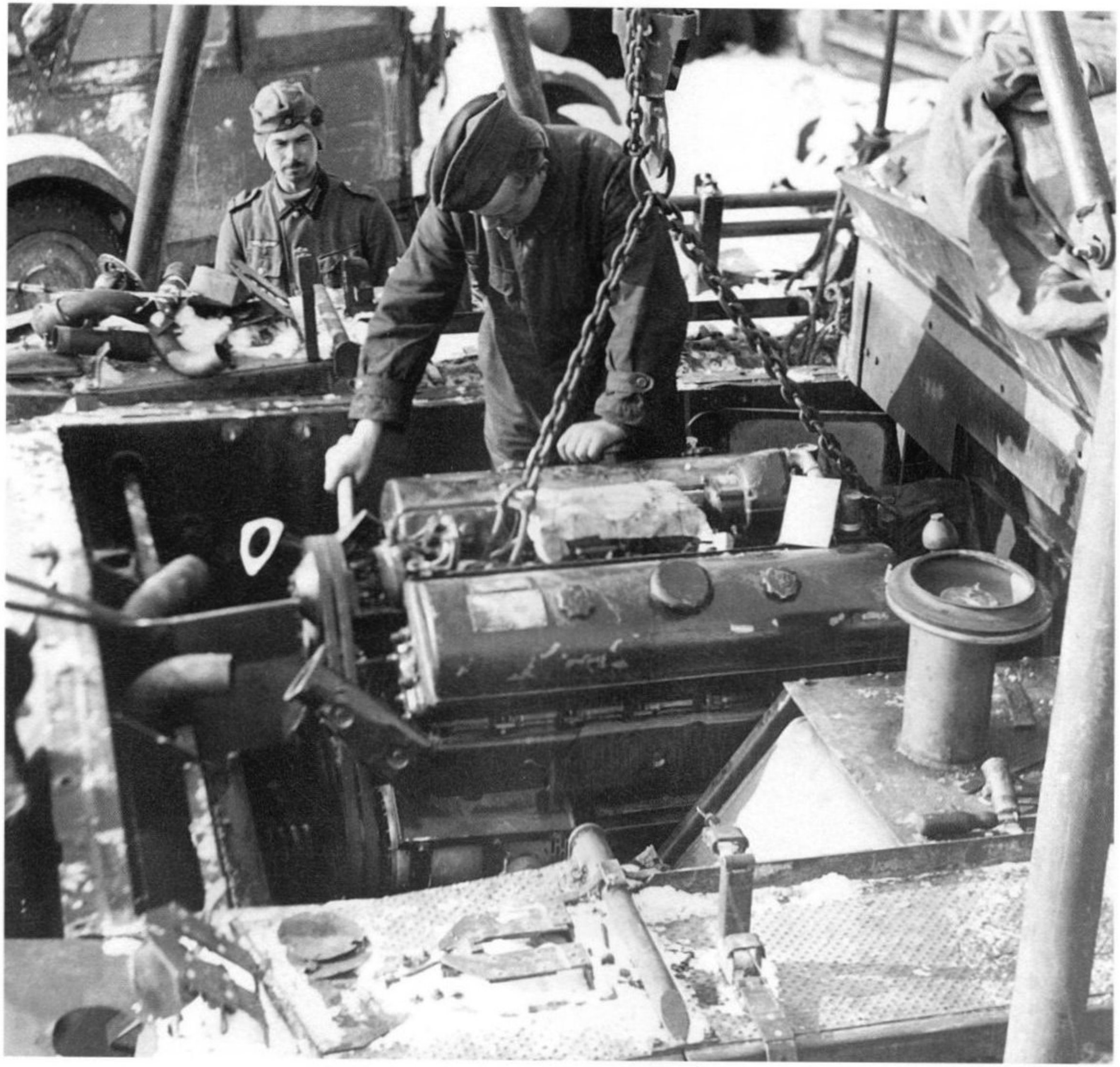


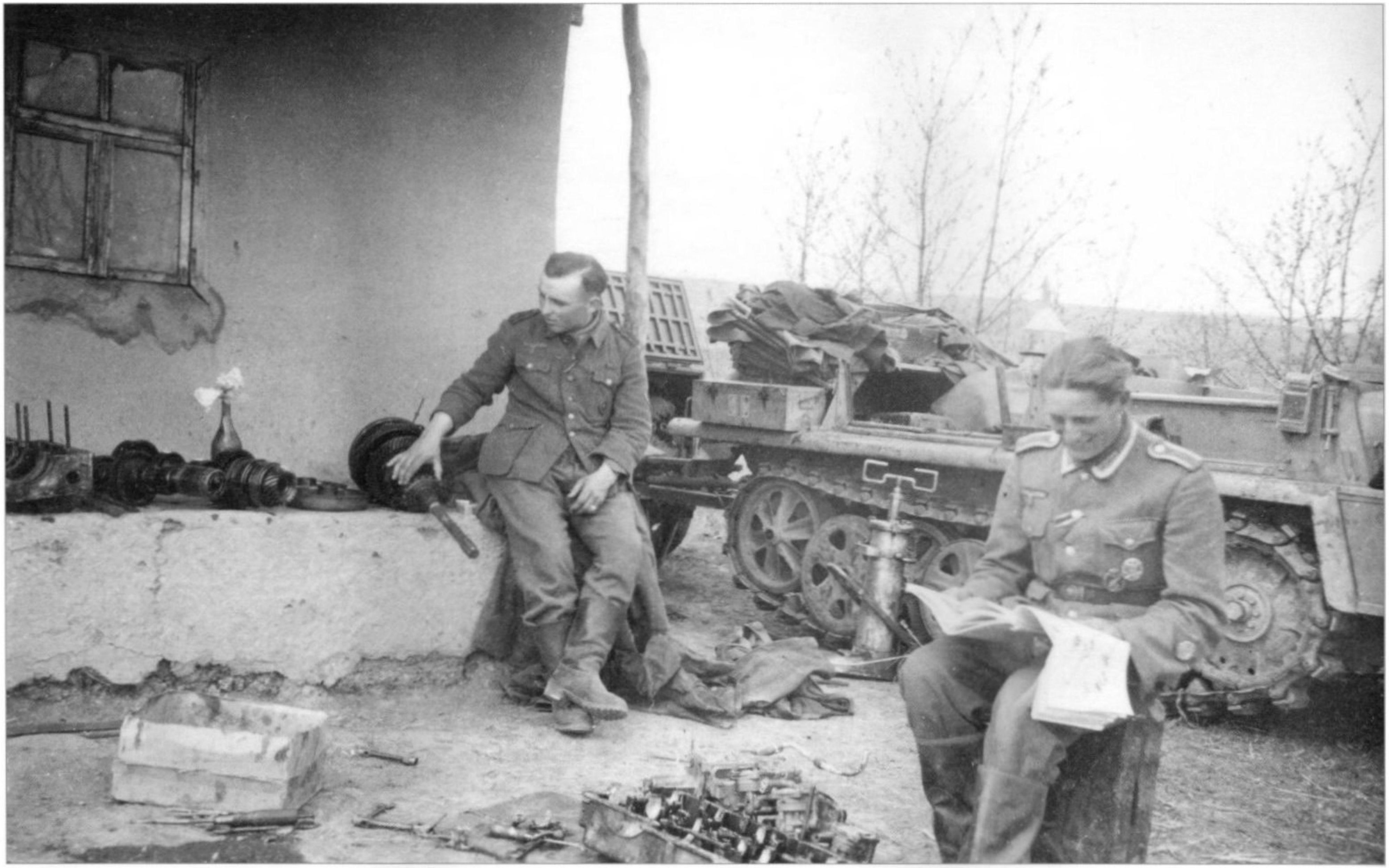
◀ The crane on the very left is still working fine: The engine deck of a StuG. Ausf.E is lifted/ lowered by the chain on the side of the crane. Note the antenna, the grass and mud on the suspension, the Russian truck in the background and the ammo stored on the outside of the other StuG. Bottom right again shows the broken crane with new hoist. *JH*



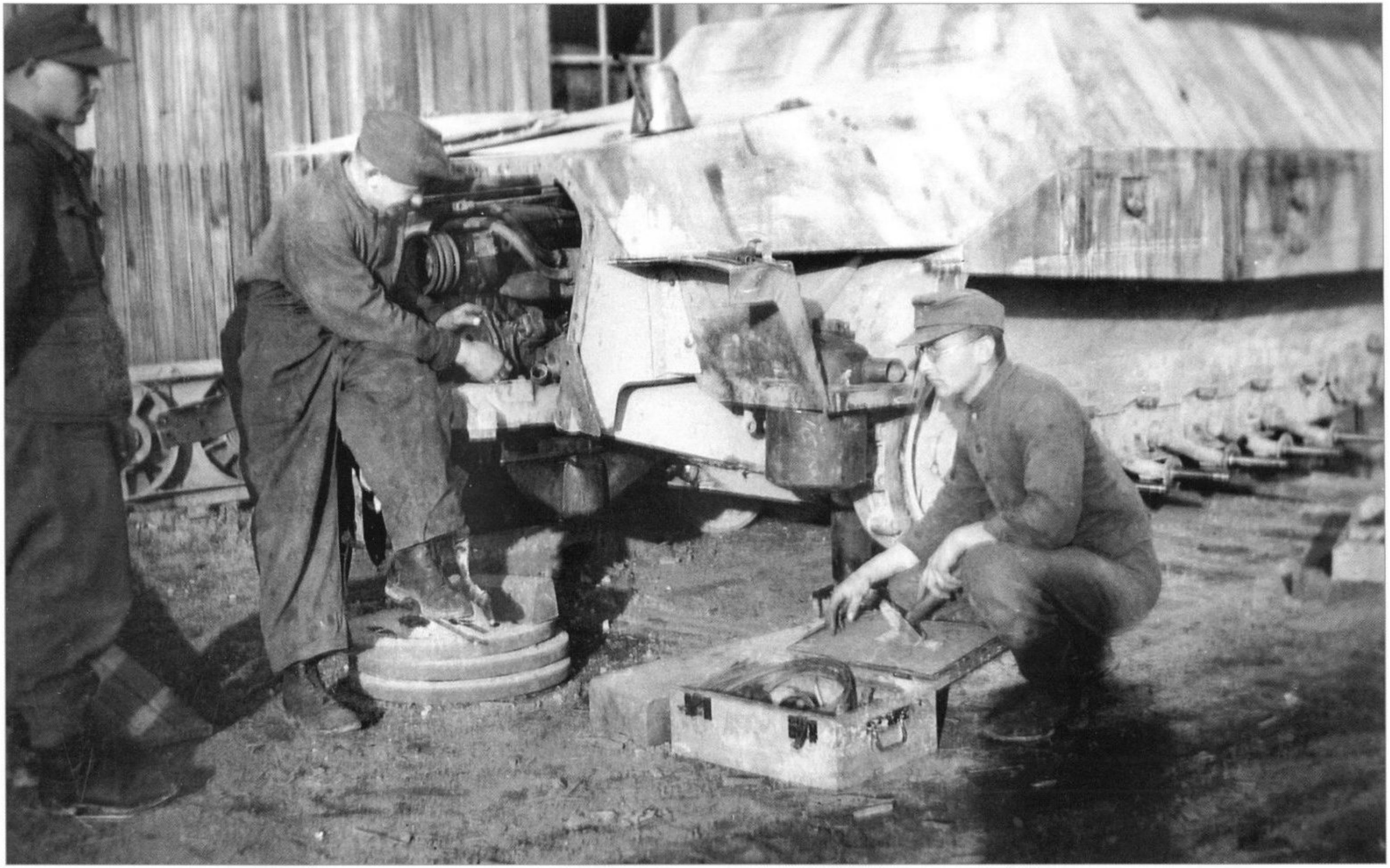
Note the beaten up mufflers and the bright inside of the wheels and the bare steel cable. The StuG is not standing right under the crane but is a bit more forward. Maybe the engine could be dismounted without having to move the StuG? The photo on the right was taken earlier when more snow was around. *JH*



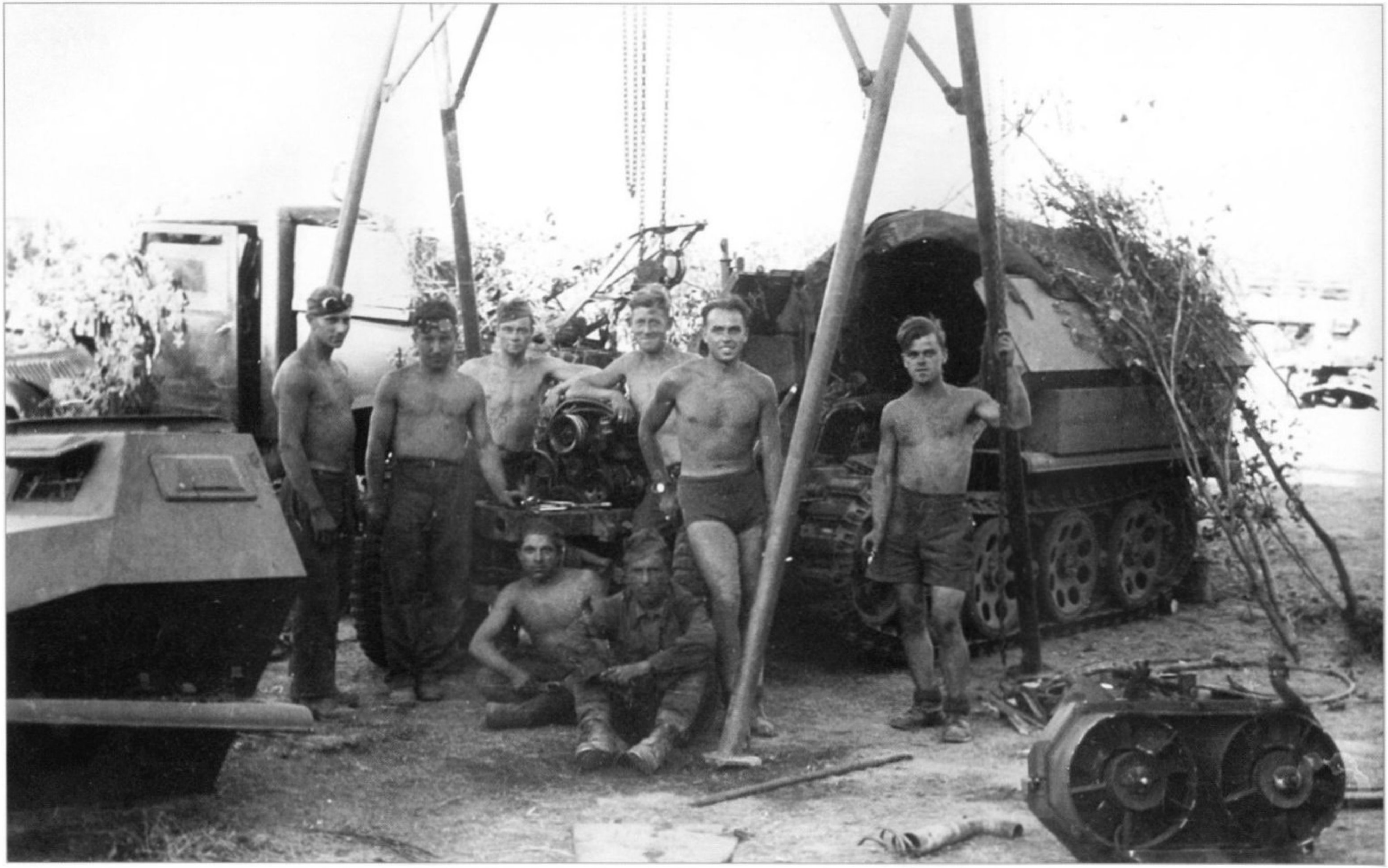




▲ A decorated NCO is studying the spare parts catalogue to his Sd.Kfz.10 while an enlisted man seems to be waiting for instructions. According to Mr. Troost, the spare parts list was also a helpful repair guide because it showed how parts fit together. *HE*



▲ A m.SPW (Sd.Kfz.251/1) Ausf.D The location is given as Croatia, 1943. Note how half the fender comes off with the front nose armor along the flange line. Dear modeler, this is a good time to take out all your 'grime streaking' modeler products. *AMC*



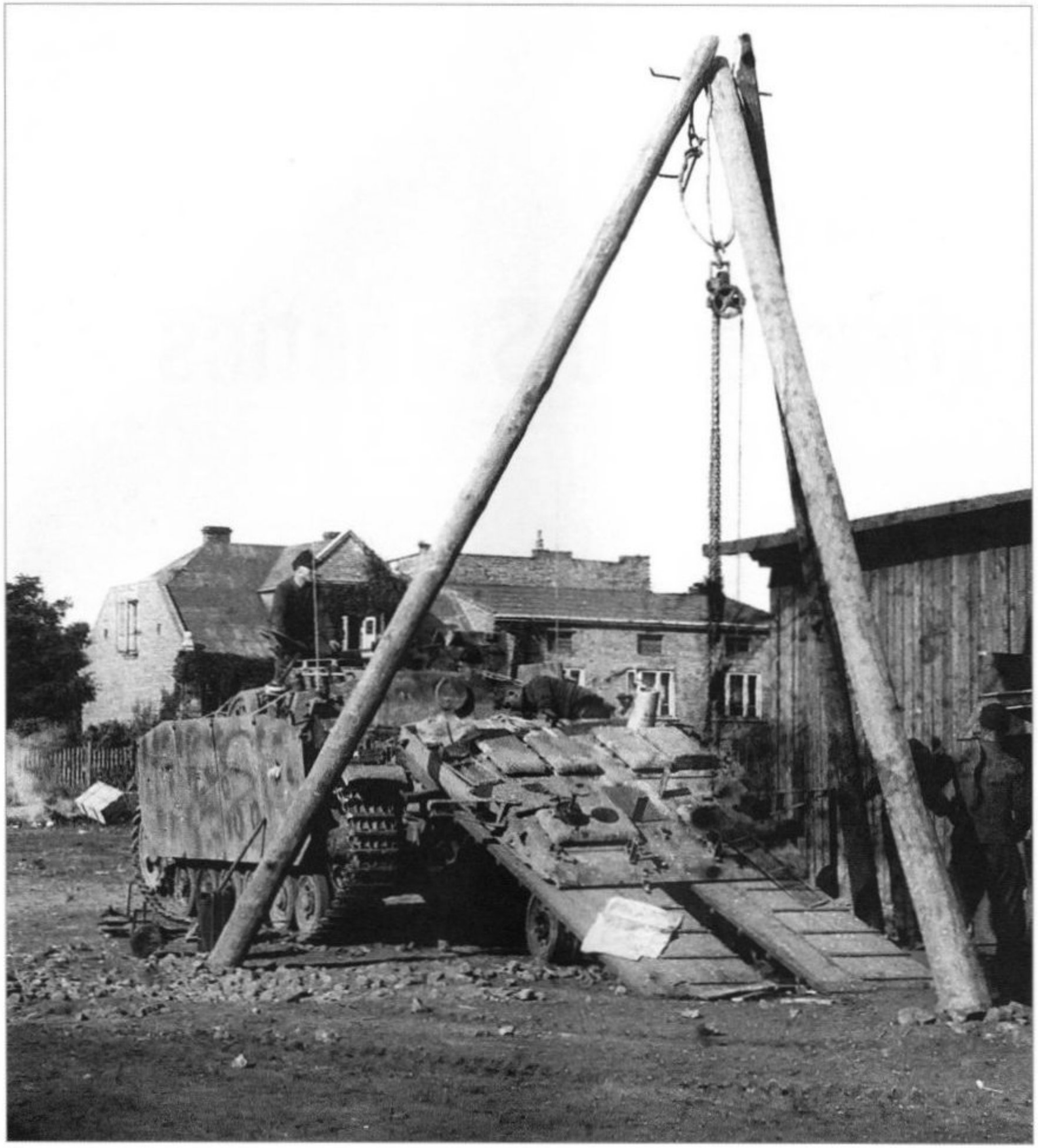
▲ The front and middle armor sections of a m.SPW have been removed to allow more elbow room for repairs (the man on the left has welder's goggles). The dual fan 'Kühler' sits in the foreground. It ran off a separate drive from the Maybach engine. *AMC*

Performance Statistics

7

Repairs in the Field 220

K-Werk and Heimatinstandsetzung 235



▲ Panzer-Abteilung (Fkl) 302 sure built an impressive provisional crane (1944). The poles are likely telegraph poles. It looks like the chains are too short to lower the engine deck all the way to the bottom. Maybe that is why the wooden ramp is used. *MJ*

Repairs in the Field

In an article written by the retired Austrian war veteran Colonel Oscar Schmilauer in 1970, he gave statistics about work expenditure during the French Campaign from an unidentified diary. It does not matter that these numbers do not come directly from an original source as such a statistic is always limited in its validity. As maintenance depends on the accommodation, the training and number of available mechanics, the available tools, the severity of damage etc., such numbers can never be more than educated estimates. Furthermore, during the French Campaign, the I-Dienste could work under almost peace like conditions and good weather.

Type of Damage	Repair time	Performed by
Track link or pin break	1 hour	Crew
Exchange shock absorber	1 hour	Crew
Carburetor fire with melted cable	7 hour	Crew
Steering brake damage	½ hour	I-Gruppe
Damaged tire on roadwheel	½ hour	I-Gruppe
Ignition failure (frequent)	¾ hour	I-Staffel
Steering gear damage	3 hours	I-Staffel
Radiator damage	3 hours	Pz.Wkst.Kp.
Jammed piston ring	6 hours	Pz.Wkst.Kp.
Starter failure	24 hours	Pz.Wkst.Kp.
Leaking seals of oil tank	24 hours	Pz.Wkst.Kp.
Leaking bearing	48 hours	Pz.Wkst.Kp.

Cpl Friedrich Bindewald, a 21 year old engineer student who served in the I-Gruppe of 5.Kp.,15.Panzerregiment (11.Panzerdivision), was captured on 13 September 1944 between Belfort and Vesoul. He told his captors a month later that the most frequent repairs were road wheels and volute springs (supporting the wheels) which had been damaged by shell fragments. According to him, the exchange of track links took 15 minutes each, a change of a roadwheel took about 30 minutes and a change of a sprocket 3 hours.

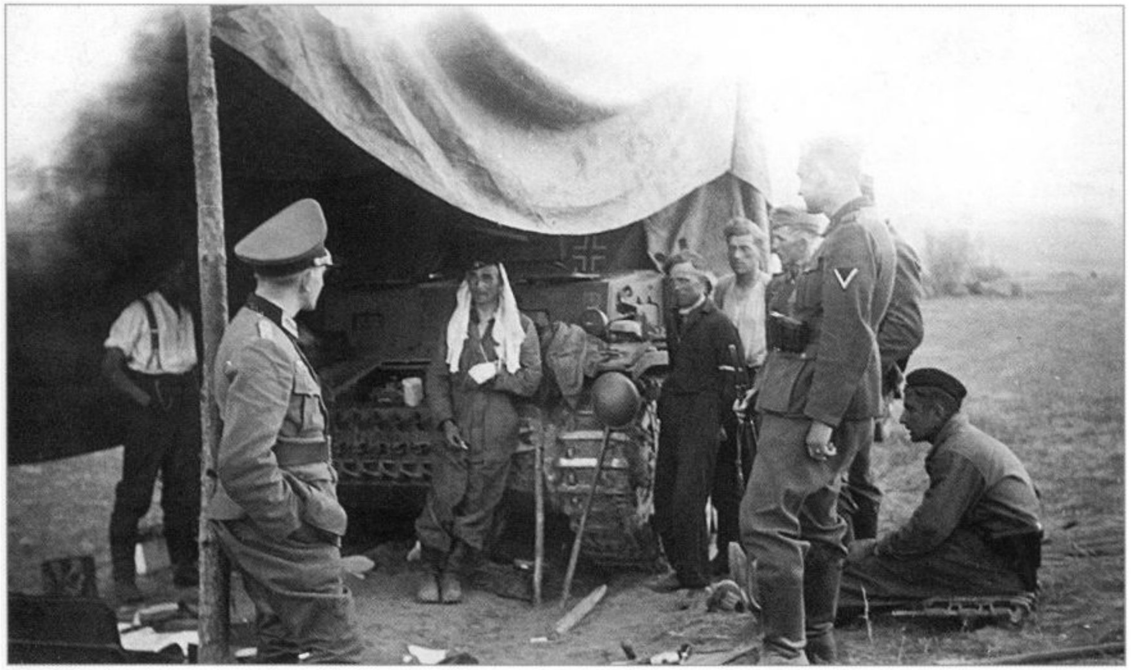
It is difficult to measure the performance of the I-Dienste of the field troops because reference parameters are missing and the work performed below the level of the Wkst.Kp. was probably not recorded at all. One of few statistics about repairs carried out in the field comes from a report of s.Pz.Abt.503, dated 10 October 1943. It covers the period from 5 July 1943 - 21 September 1943 during which the Abteilung suffered 18 total losses of which four were sent to the homeland:

- *During the report period, the Abteilung had approximately 12 Tigers operational on paper each day. Due to mechanical break-downs on the way from the Werkstatt to the fighting troop, the actual daily average was around 10 Tigers.*
- *During the report period, 240 Tigers were sent to the Werkstatt for repair. The vehicles worked on by the I-Gruppen (mostly light damage to the suspension) were not counted in the above total.*
- *During the report period, 275,919kg of replacement parts were used for the Tigers.*
- *The supply section covered a distance of 14,000km in the first nine months.*
- *In the first nine months, the fuel section brought forward 1,500,000 liters of gasoline and 250,000 liter of diesel. This is equivalent to 88 Panzer wagons.*
- *Each of the 18t Zugmaschinen of the Bergezug had recovered Panzers an average of 7,000km during the first nine months of the operation.*

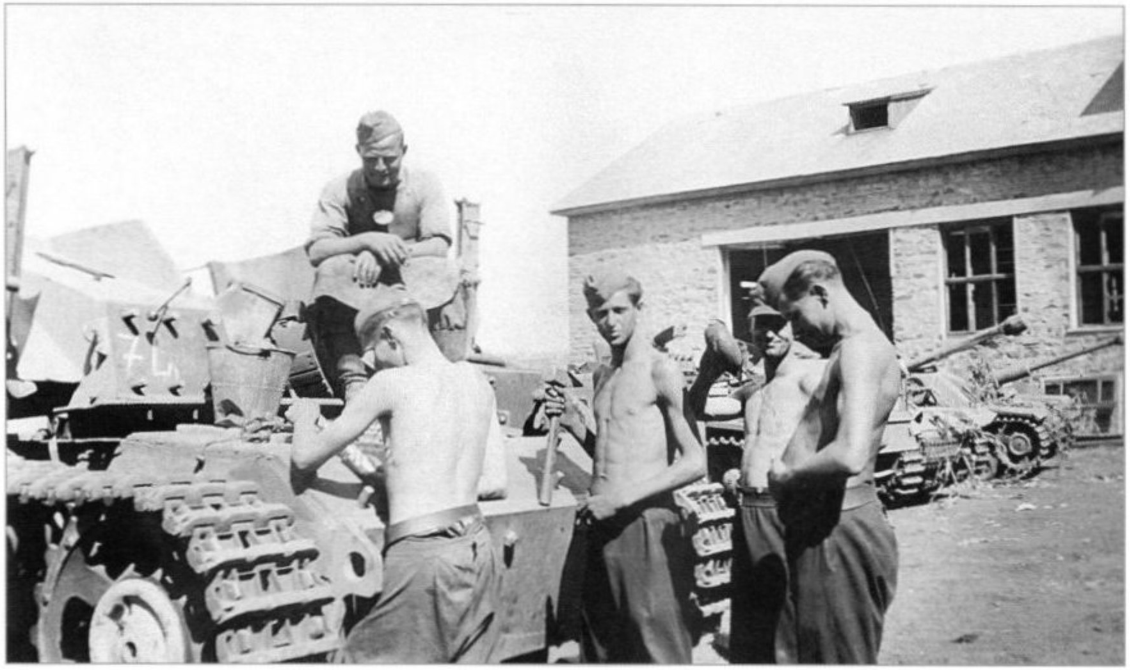
More data can be extracted from a nomination for the Knights Cross to the War Merit Cross with Swords for Heeres-Hauptwerkmeister Anton Sextl, the Werkmeister of the Pz.Werkst.Kp. of I./Pz.Rgt.35, written by Hauptmann and Abt.-Kommandeur Schultz:

> *In the deployment starting 5 July 1943 [probably until 15*

▲ A Pz.IV tactical number '321'of 2.Pz. Div. drove off the road on a hairpin bend in a valley bottom in the Balkans. Note the wounded tanker on the right. *HE*



▶ A Pz.Kpfw.IV of 20.Pz.Div. seems to be a gathering point for people. Note the German cross painted on the turret front. *MR*



August 1943] Hauptwerkmeister Sextl again exceeded his past achievements. The Abteilung had a combat strength of 80 Pz. Kpfw.IV lang, 15 Pz.Kpfw.III 7.5cm kurz and two Befehlspanzern. The Werkst.Kp. of the independent Abteilung had 42 Kfz.-mechanics, eight Waffenmeistergehilfen and three signal mechanics. For this large number of Panzerkampfwagen so far always a Werkst.Kp. with two platoons was assigned. The Werkst. Kp. I./Pz.Rgt.35 has however only one platoon and it is still short 13 mechanics. Despite this handicap Hauptwerkmeister Sextl could obtain the following maximum performances in the repair:

Apart from smaller damage on the Panzerkampfwagen in combat, which were repaired immediately on the battlefield by the I-Trupps of the Abteilung, 140 Panzers had to be towed to the Werkst.Kp. for more extensive repairs. Replaced were: 7 transmissions SSG 76, 1 transmission SSG 77, 3 final drives Pz.Kpfwg.IV, 14 spur wheels and pinions in the final drive. Altogether 65,000kg of spare parts were used. 180 clutches were replaced or renewed. 300 spring suspensions for Panzers, Zgkw. 8, 12 and 18 tons, partly repaired, partly newly manufactured (Wheeled vehicles are included in the clutch and spring damage). The lathe works, which were carried out during this month, earn special attention. Shortage spare parts which could not be procured were fabricated by Sextl. Thus among other things 250 muzzles ['Feuerdüsen'] for M.G. were turned, innumerable cans, hubs and fitted screws, heart pins for spring suspensions, ball pins for steering assemblies, standing and king-pins of all kinds were made. In difficult cases Sextl stood at the turning lathe and accomplished most complicated turnings, e.g. such for the turret traverse drive and the elevating gear. There was nothing that was not forged or was not turned.

Each Panzer that returned from the battlefield was in need of extensive welding repair due to bombardment or mine damage. Two electrical and one autogenous welding sets were deployed

◀ Note the spare road wheel mount and the tactical symbol for a StuG unit on the left side fender. *JH*

▲ Skinny mechanics fooling around and welding on a StuG with a differing hub cap on the sprocket and its extra armor on the superstructure dismounted. *JH*

from 4:00 o'clock in the morning until nightfall.
Due to difficult road conditions, damaged towing assemblies of the 12to and 18to Zugmaschinen had to be repaired on a daily basis. Each day new cross beams and new reinforcement had to be attached.

Above all, forging the towing hooks and tow bars for Panzers was most difficult because of the lack of material. However, thanks to Sextl, torn off tow hooks were again forged and attached to over 100 vehicles. In 31 cases the Panzer's engine deck had to be removed and the engine lifted out because of defective starters. 23 generators were repaired in the Werkst.Kp.35 radiators were heavily damaged by bombardment and shelling. These were repaired likewise again with field-made means.

When assessing the number of the repairs accomplished it must be considered that the Werkst.Kp. had to relocate eight times. In each case one day of work was lost. The technical quality of both the large and the small work was excellent and in no way inferior to a stationary workshop.

Sextl earned the decisive merit when he saved 21 Panzerkampfwagen, which had to be counted as total losses even when applying a sharp yardstick, by replacing turrets, armored superstructures and by welding hulls (steel plates up to 0.75m were cut out and remounted).

The Abteilung could hardly be deployed as a single unit. The companies often had to fight independently, far away from each other. Therefore it was of decisive importance that the combat strength never dropped below 8 - 9 Panzers per company as otherwise they would have been overrun by the enemy's superior numbers.

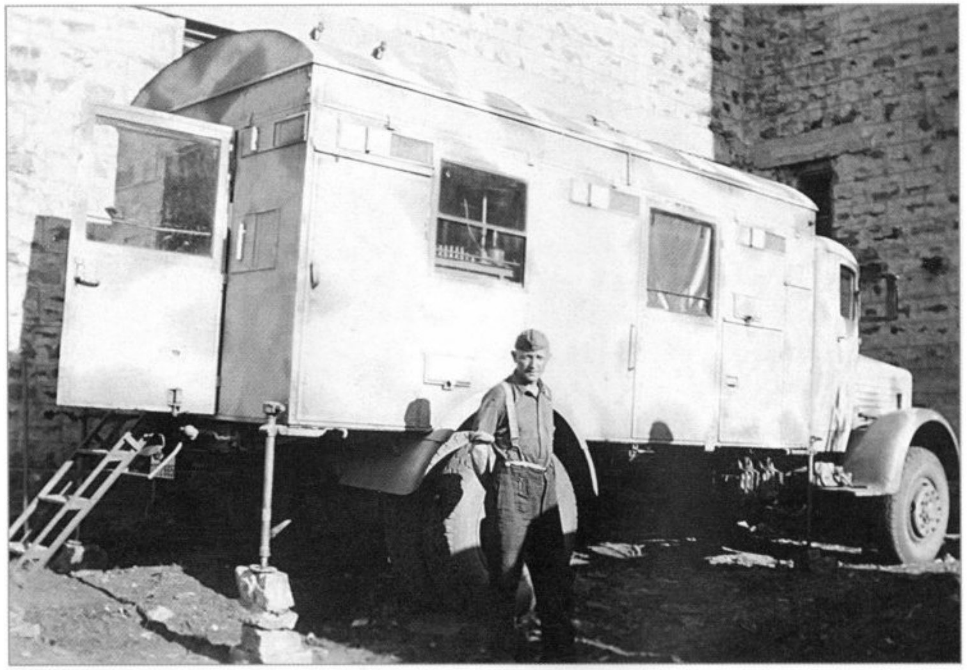
Anton Sextl was awarded the Knights Cross to the War Merit Cross with Swords on 13 September 1943. He was born on 26 July 1904 and worked as an auto mechanic at the FAUN-Werke in Ansbach from 1917 - 1927. Then he was lead man at the Panzerregiment 3 in Bamberg from 7Dec36 - 9Nov38. Sextl was later promoted to Heereswerkmeister (10Nov38), Heeresoberwerkmeister (1Nov39) and Heereshauptwerkmeister (1Aug42). Besides the consecutive line of War Merit Cross awards, Sextl also received the Iron Cross second class for performing repairs in the frontline under heavy enemy fire in February 1943.

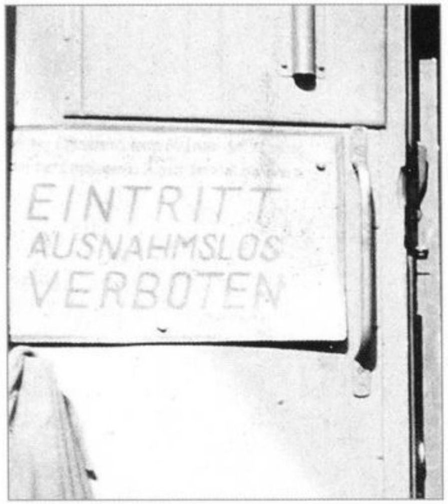
Prisoner of War private Hans Hurler, a member of the Stabskompanie I./Pz.Rgt.3, described the I-Dienste of his unit nine days after his capture in Trun, France, on 21 August 1944. The information obtained was considered reliable by his interrogators.

Percentage in Wkst.Kp. at any one time for reasons of mechanical break-downs:
On an average 5 - 6 Panzers were at the I-Staffel, 10 - 15 in the Wkst.Kp. for repairs. The average time was half a day at the I-Staffel, 5 - 6 days at the Wkst.Kp.
The I-Staffel was commanded by a Haupt-Werkmeister and consisted of 35 men, [an unknown number of] Wkst. trucks, a 18t Zgkw. with crane, a 3to crane on truck, 6 - 7 3to trucks for spare parts, one large Büssing truck with 2,5m lathe, one truck with welding equipment. The recovery section consisted of 14 men, one Bergepanther and three 18t Zgkw.
The I-Gruppen consisted of an Uffz. and 5 - 6 men, one 1t Zgkw. with spare parts and a Kettenkrad.
Hurler gave no information about the Wkst.Kp.

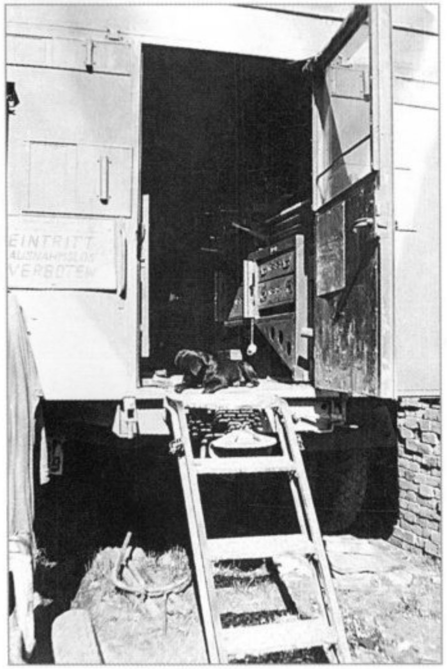
Major [Dipl. Ing.] Hans-Joachim Schwaner, Abteilungskommandeur of s.Pz.Abt.502 wrote a technical experience report for the period from 22 June 1944 until 10 August 1944 as of 21 August 1944:

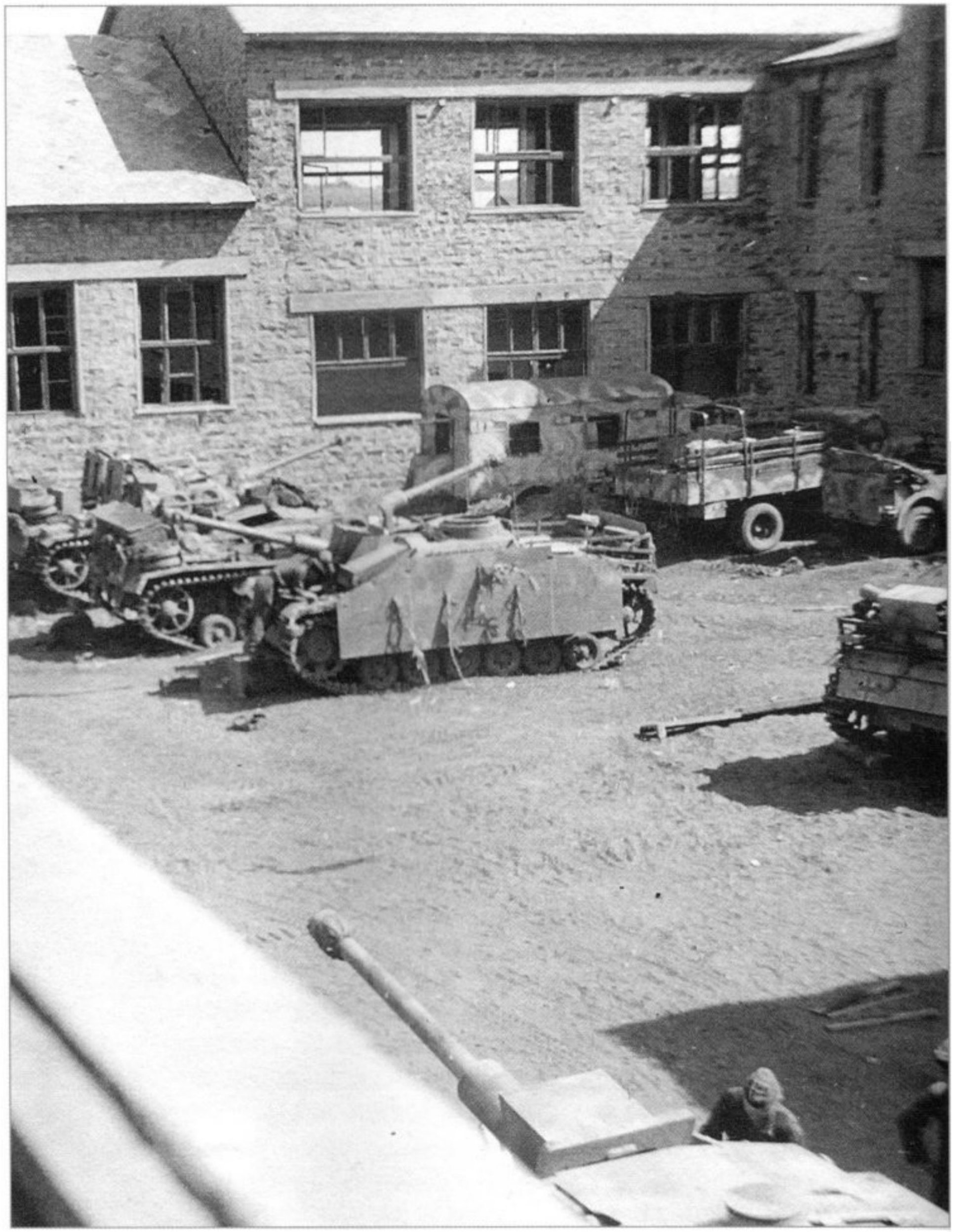
The Abteilung, equipped with Pz.Kpfw.VI type E, had an eight week replenishment period in the area of Ostroff-Pleskau, from the end of April until the middle of June. This period allowed for extensive maintenance that included repair work that cannot be prepared while in combat, such as general overhaul of suspension, cleaning of the complete cooling system, fuel system, inspection and adjustment of the engines, transmission, turret drive and steering gear. Spare parts were guaranteed thanks to the long rest period.



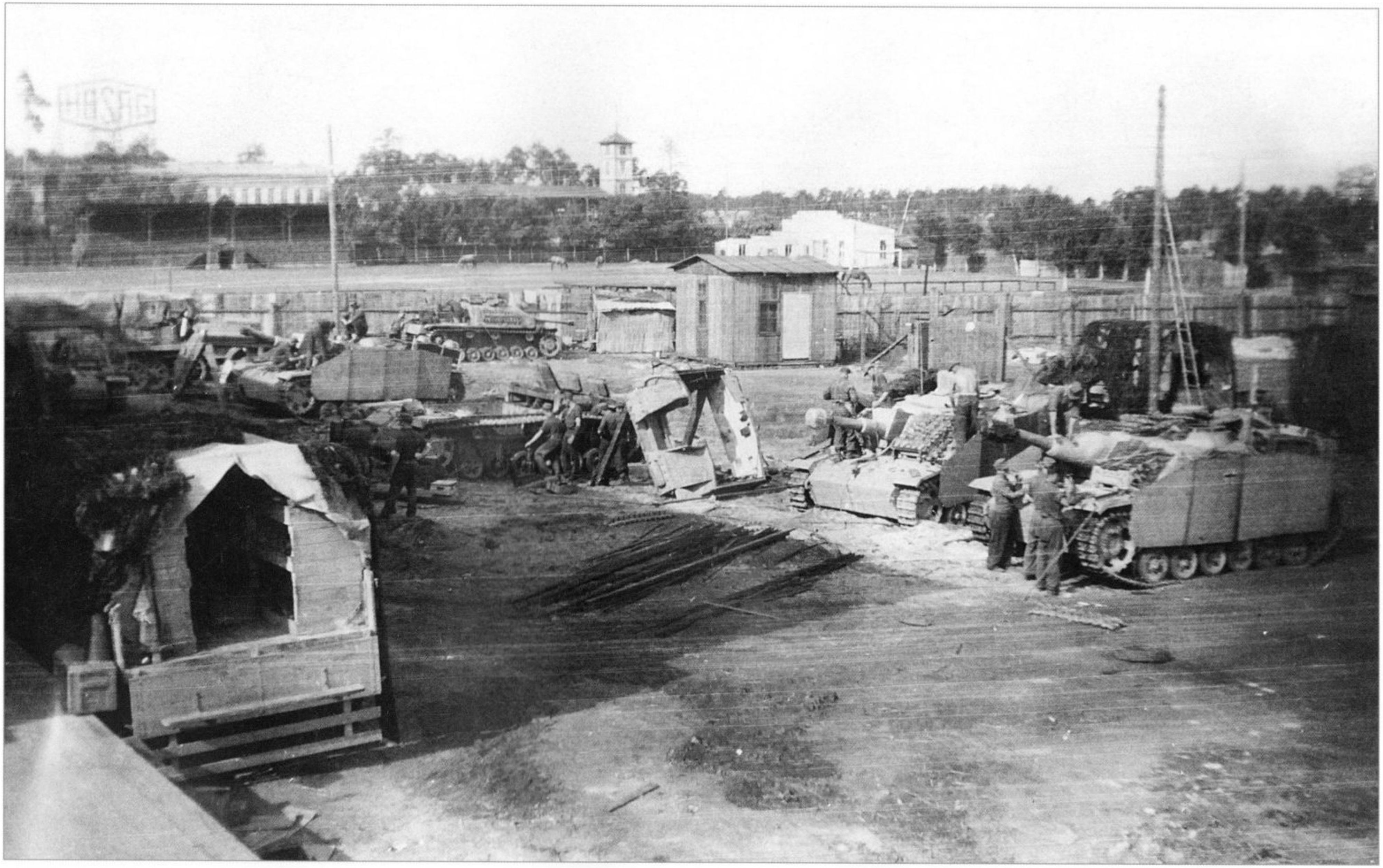

EINTRITT
AUSNAHMSLOS
VERBOTEN

Entrance to this Wkst. truck of StuG.Abt.210 was forbidden without exception. The truck has been jacked up on one side to level it. *JH*

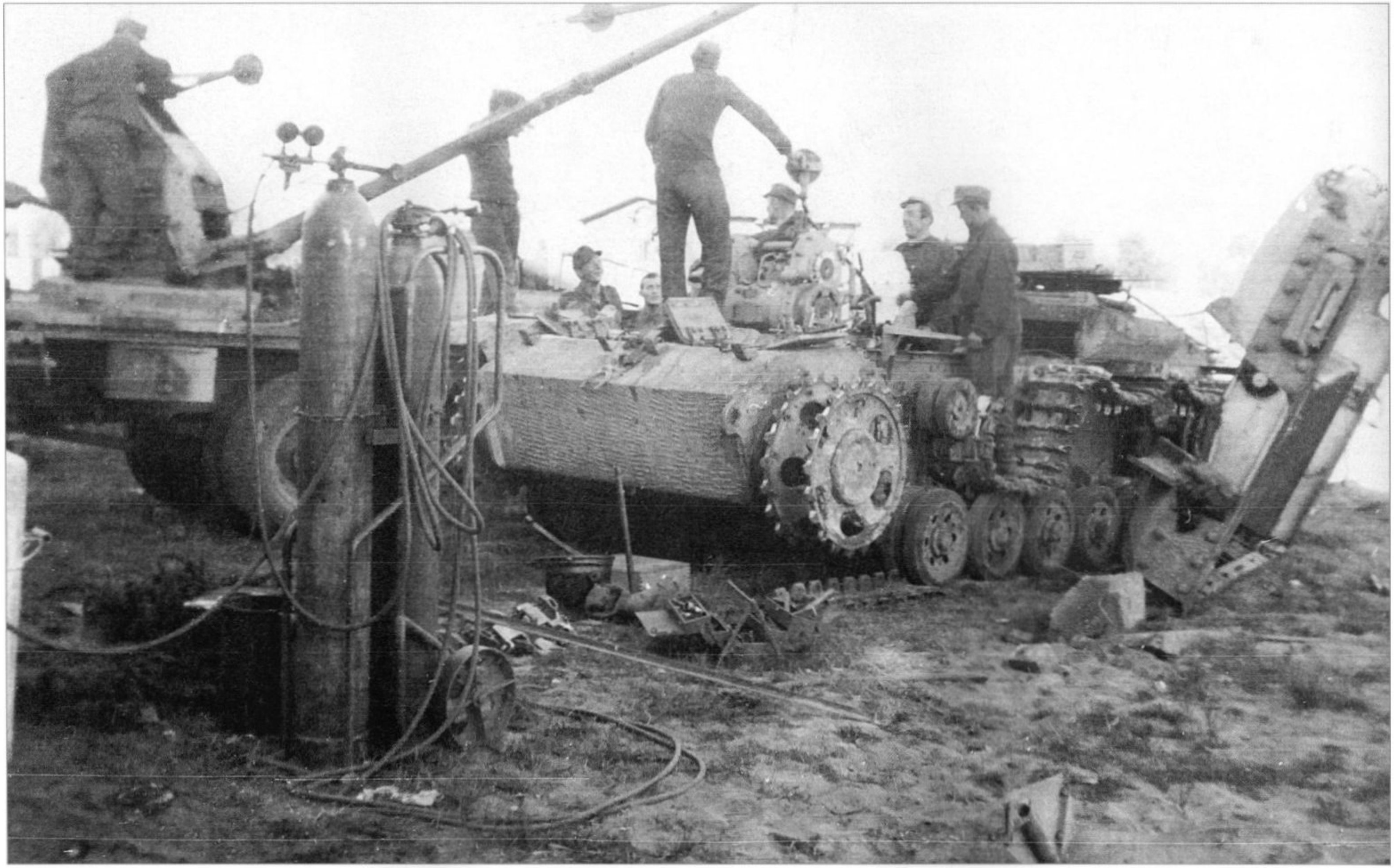

EINTRITT
AUSNAHMSLOS
VERBOTEN



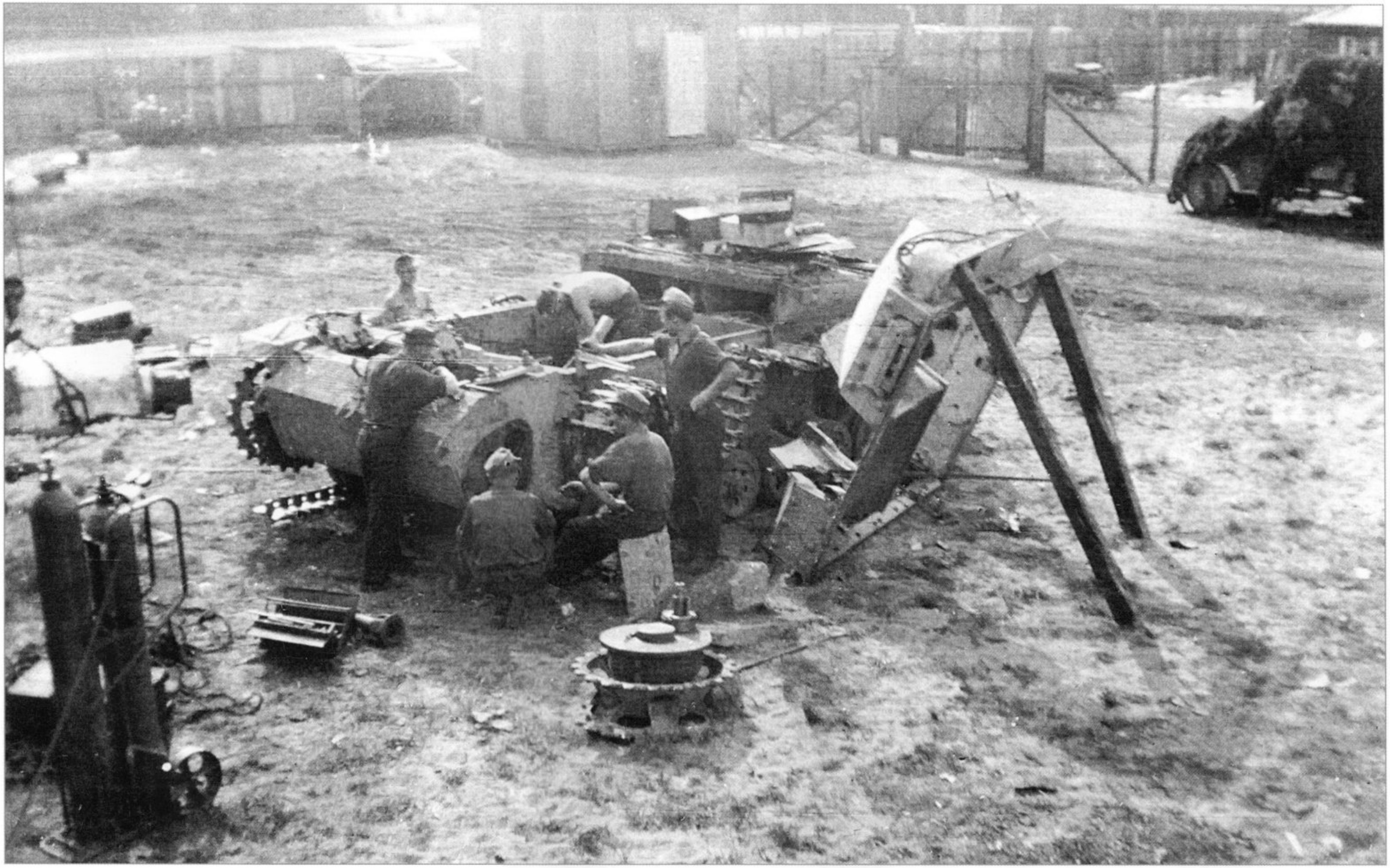
StuG Ausf.F und G from StuG.Abt.210 in the Wkst. area in 1943. Some of the guns have 'Schürzen' (side skirts) mounted. A variety of different frames or boxes to carry additional stowage have been mounted to the rear decks. The same practice on Panzers with rotating turrets could lead to a limited field of fire. *JH*



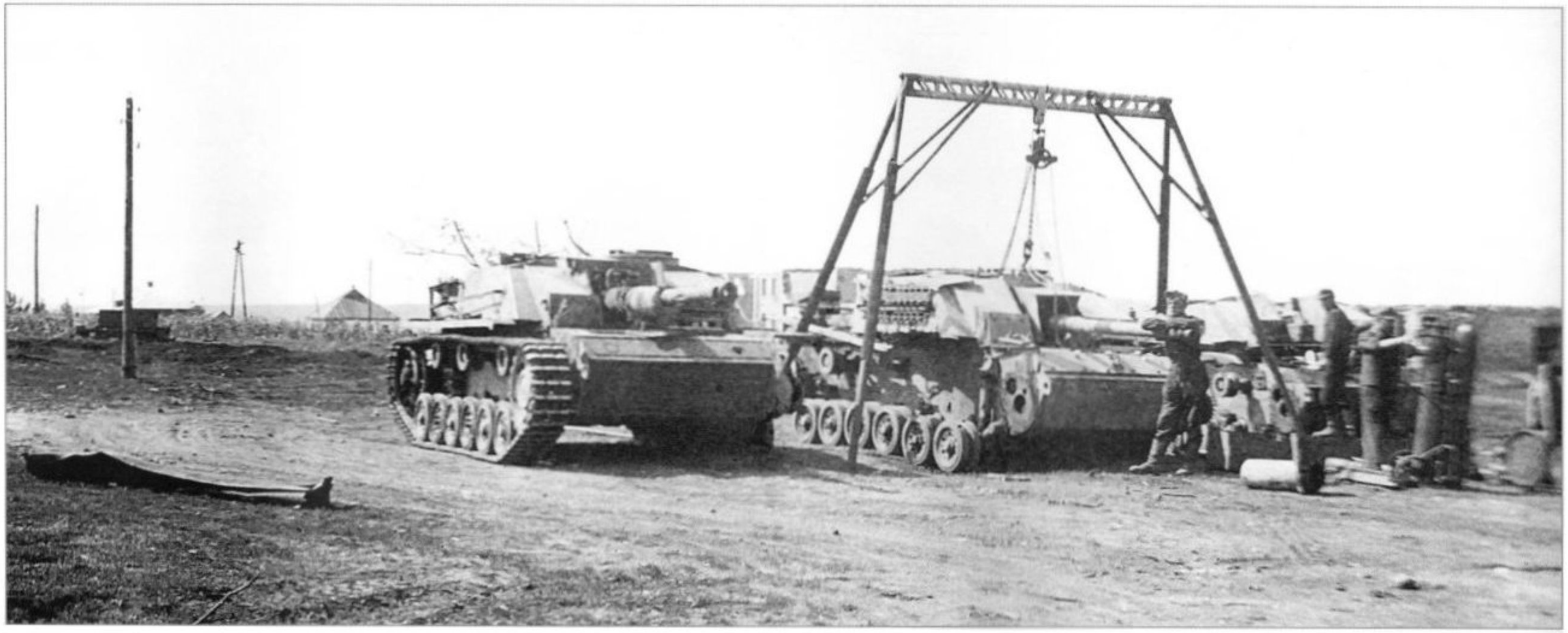
▲ The Wkst. of StuG.Abt.210 in Ostrowice, Poland, Sept44. The guns and howitzers have many different fittings. HASAG (top left corner) was a metal goods and weapons manufacturer, infamous for employing (and cultivating) a lot of slave laborers. *JH*



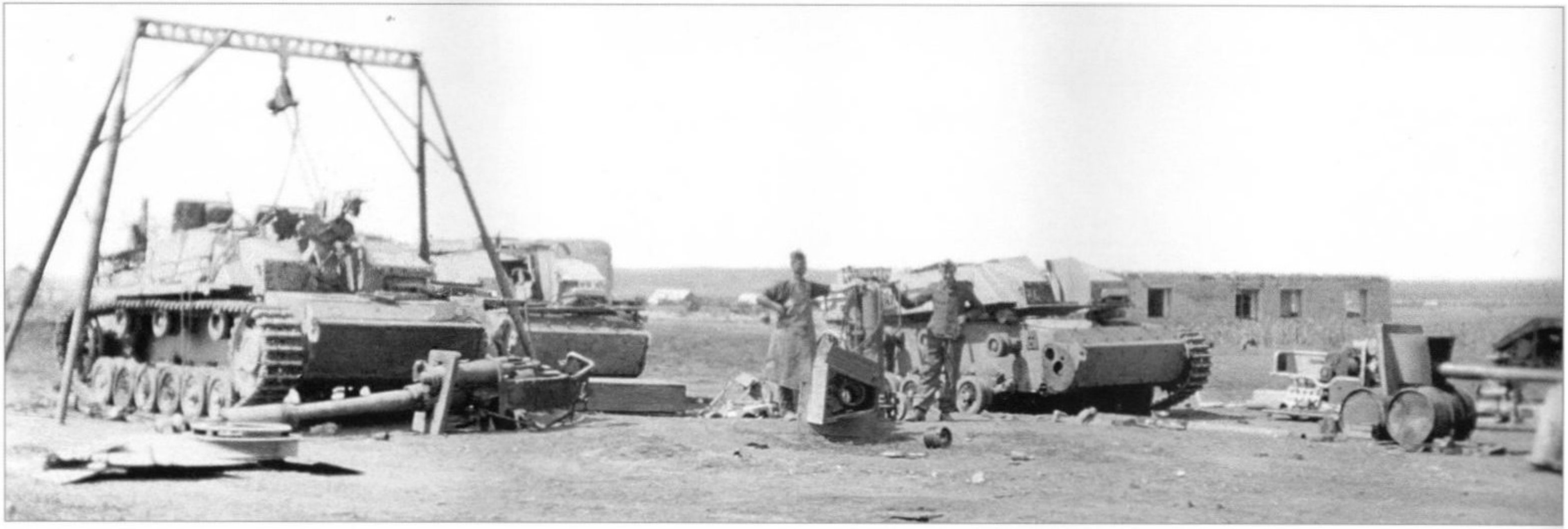
▲ According to Karlheinz Münch, the Wkst.Kp. of StuG.Abt.210 lost all its gantry cranes as a result of the hasty withdrawals in 1944. Obviously it complicated maintenance. *JH*

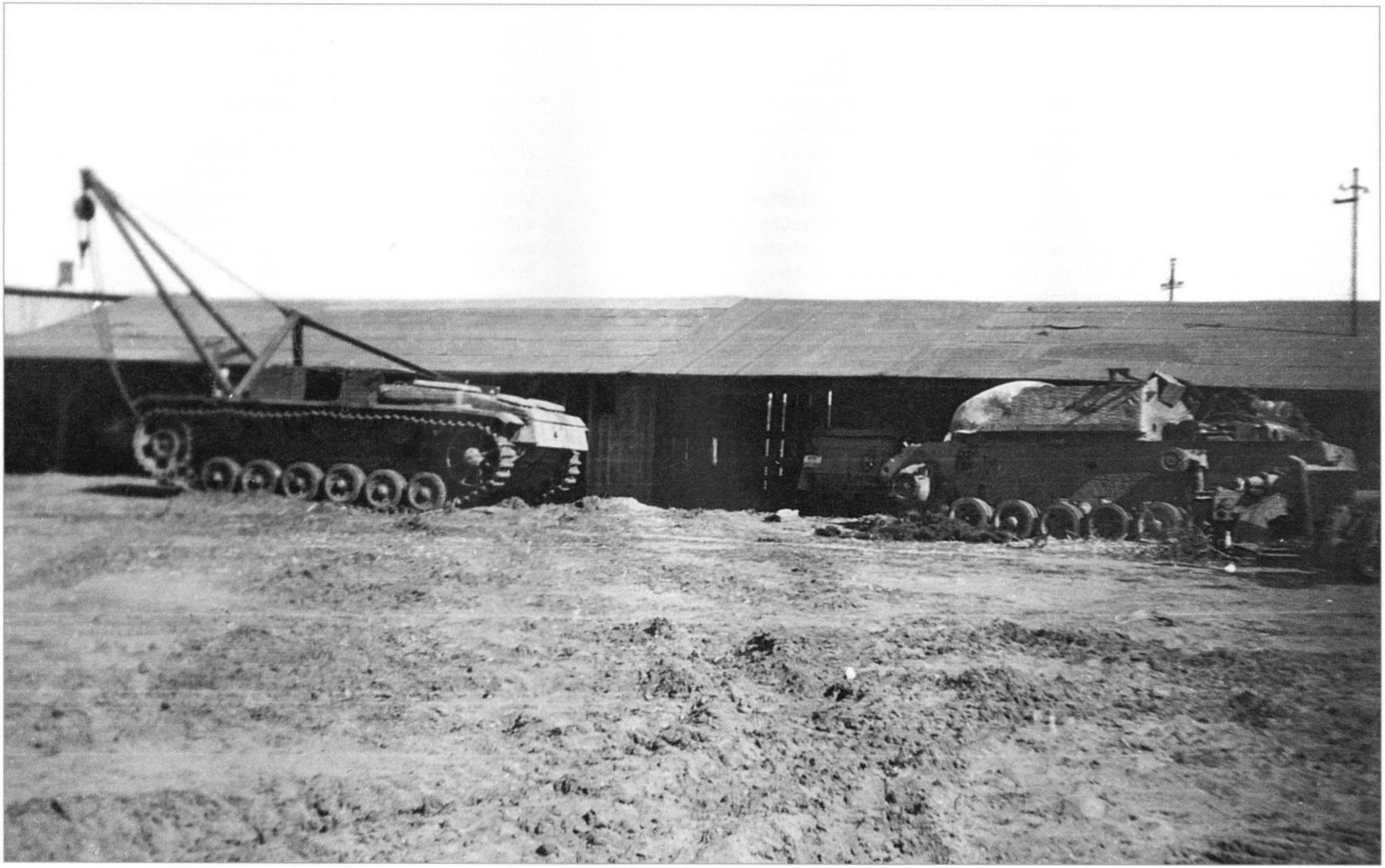


▲ This StuG is the same as on the left page, identifiable by the horse shoe on the front armor, among other things. It can not be said with certainty if concrete armor has been fitted on top of the driver's compartment. The unit did so to some of its guns. *JH*



StuG.Abt.210 used a lot of different gantry cranes not often seen, such as this one. *JH*





▲ StuG.Abt.210 mounted a makeshift crane on a StuG chassis due to the shortage of lifting devices. Note the thick layer of concrete 'armor' that has been applied to the other StuG. *JH*

The march to the combat zone on 22 June 1944 happened during the night and rain. The damage - one engine fire, one broken radiator shaft and some screws from a drive shaft tearing off were meaningless and could quickly be fixed by the I-Dienste in no time. No damage occurred to the suspension despite marching distances of 30 - 50km.

The combat itself mostly brought break-downs due to enemy fire. Technical damage, like wheels and rubber tires tearing off, drive shaft screws shearing off, tracks climbing off the sprocket as well as engine fires (caused by fuel pipes tearing off due to enemy fire) could be fixed quickly thanks to the good spare part situation.

Regarding spare parts and work, the first technical losses during the initial combat in the area south of Dünaburg could be completely managed by the I-Dienste. But when the tactical situation required daily marches of 80 - 100km under tremendous heat, the I-Dienste could not cope with the enormous number of technical break-downs anymore, despite working day and night. The construction of the suspension did not allow such long marches. The rubber tires of the inner road wheels wore loose very quickly under strong forces, which then resulted in overloading the other road wheels. These then wear down very quickly as well, especially in great heat. Marches without pause soon led to considerable damage or the destruction of the road wheels, road wheels bearings and crank arms ('Schwingarme').

The hard shocks make the torsion bars ('Stossdämpferschwingarme') break especially frequently. Even when all spare parts are available, a Pz.Kpfw.VI damaged in such a manner needs 30 - 36 hours to repair. In the case of a broken rear torsion bar, the engine needs to be dismounted. Many of the suspension parts are 'Engpassteile' and were not available to the Abteilung.

In the next section Schwaner went into the engine fires, which resulted from overheating (low HP to vehicle weight ratio and high air temperatures of up to 35 °C).These fires, eventually caused by oil leaking and carburetor fire, couldn't be stopped despite increasing the radiator speed. The well working automatic fire-extinguishing system prevented severe damage. Enemy fire mostly damaged the final drives, sprockets, idler and road wheels. Schwaner concluded:

> *The aforementioned enormous marches resulted in hitherto unseen consumption of all spare parts (50 - 60to). With the available stock, the I-Dienste could work without major difficulties for eight days. Despite farsighted planning in spare part supply, it soon was not possible to repair Pz.Kpfw. in the short-term. The maintenance performance was greatly hampered by the relocation of the Panzer-Ersatzteillager A from Riga to Königsberg, as well as the stoppage of all single transports within the H.Gr. North. A transport of two wagons with urgently needed Tiger spare parts needed 14 days from Riga to Königsberg.*
> *The most urgently needed spare parts were procured by trucks from the Abteilung. ...*

Work Performance of the Werkstatt-Kompanie in the period from 22 June 1944 - 21 August 1944:

Number of repairs:

a) I. Wkst.-Zug: Pz. VI: 38 Zgkw.: 17 Lkw:9
Pkw. 20
Krad: 10

b) II. Wkst.-Zug: Pz. VI: 64 Zgkw.: 24 Lkw: 26
Pkw. 24

c) Waffenmeisterei: Handwaffen: 8
M.G.: 11
Kanonen
incl. 2cm FL-Vierling: 21
Turret and traverse gear: 62

d) Wa-Werkstatt: Radio equipment in ca. 80 Pz.Kpfw.

e) Bergezug: 144 recoveries and evacuations. Thereby, the *recovery columns (in average consisting of three 18t Zgkw.) drove ca. 4,280km.*

Number of heavy repairs:

Pz. engines:	*45*
Pz. transmissions:	*39*
Pz. suspensions:	*71*
Shell damage that needed welding:	*21*

Work performance of the I-Staffel of the Stabs-Kp. in the period from 22 June 1944 - 21 August 1944:

Number of repairs:

Pz.Kpfw.VI:	*26*
Zgkw.:	*8*
Lkw:	*4*
Pkw:	*15*
Krad:	*...*
SPW:	*9*

Number of extensive repairs:

Pz. engines:	*5*
Pz. transmissions:	*2*
Pz. suspensions:	*11*
Shell damage that needed welding:	*1*

Schwaner's report includes repair statistics over the period from 23 June 1944 – 25 August 1944. In that period, the Abteilung suffered 12 Pz.Kpfw.VI and one motorcycle with sidecar as total losses and 28 Pz.Kpfw.VI, two SPW and two Lkw lost to shelling that were recovered and repaired. The numbers show a one-time high of nine repaired Panzers a day and many days with no or just one finished Panzer.

The O.Qu. of H.Gr. Weichsel sent an overview about their Panzer inventory as well as the deployment of the Pz.-Inst.- and Bergedienste as of February 1945 to Gen.Insp.d.Pz.Tr.

Pz.Instandsetzung:

The Pz.-I.-Dienste of the Heeresgruppe were not fully busy and thus more than ready to accept more work. The Pz.-I.-Dienste of the troops on the other hand were overloaded, because an evacuation of damaged vehicles to the rear I.-Dienste was not possible due to transport difficulties. For this reason it was necessary to command detachments of Pz.Inst.Gruppe Middle and Pz.Inst.Abt.559 to the I.-Dienste of the troops.

Constraints in maintenance could be ascribed to the lack of spare parts. Because of railroad transport difficulties, Panzer spare parts needed to be supplied by truck. Lack of cranes (Sd. Kfz.9/1, Kfz.100 and gantry cranes).

The Wkst. equipment of Pz.Inst.Gruppe Middle (machines and equipment) were lost in Kreising and Warthelager during disengagement.

According to the order of OKH/GenStdH/GenQu/GendKfw Gr. V(J) I No.626, the H.Gr. Weichsel has to support the rebuild of Pz.Inst. Gruppe Middle in Neuruppin with all means. Parts of Pz.Inst. Gr.North in Braunsberg/Ostpr. are transferred to Neuruppin and subordinated to H.Gr. Weichsel.

Beute-Pz. T-34 are delivered to Pz.Inst.Gruppe Middle in exchange for a reward.

Krupp Druckenmüller Berlin-Tempelhof was commandeered for Panzer maintenance for H.Gr. Weichsel.

Alkett, Berlin-Spandau, starting repair for Pz.Kpfw.III, Pz.Kpfw.38, Jagdpanzer 38 and s.Pz.Haub. and Hornisse.

Damage to HL 230 occurred in high numbers due to the use of thin engine oil. H.Gr. Weichsel thus ordered to use summer oil for those engines.

Pz.-Recovery

General lack of recovery means. Total write-offs of armored Kfz. are very high due to insufficient fuel and recovery means.

Pz.-Instandsetzungsdienste

1. *Fa. Krupp-Druckenmüller ...*
2. *Pz.Inst.Abt.559 in Weldegk ...*
3. *Pz.Inst.Gruppe Middle, Neuruppin, Tel. Neuruppin 2881 (only T-34)*

4. *Pz.Wkst.Kp. (Eisb) 658 in ...*
5. *Fa. Auto-Union A.G. Stettin, ...*
6. *Maintenance of Pz.Kpfw.III and IV, le. and m.Schützen Pz.Wagen, Zgkw. 1 - 18t (Spezialinstandsetzung Zgkw.3t), Maybach HL 230 engines (Panther and Tiger)*
7. *Fa. Hans Dau, Stettin, Königs-Jäger-Kaserne, Falkenwalderstr., Tel 36 319. Repair of Maybach HL 120 engines.*

Delivery of Damaged-Panzers

Damaged Panzers must be delivered directly to the above mentioned Pz-Inst.-Dienste. Fa. Krupp-Druckenmüller and Pz.Inst.Abt.559 are not totally busy and immediately ready to accept more work assignments. Pz.Kpfw. with severe damage and scrap Panzers must be sent to Fa. Krupp-Druckmüller.

One driver and one escort must be left with the gep.Kfz. The gep. Kfz. handed-in remain property of the troops.

The repair of armored vehicles in February 1945 is shown below.

Repaired & finished by	Pz.IV	Pz.V	Pz.VI	StuG	Sf.	Pz.Sp. Wg.	Engine	Transmission	Final Drive
Pz.Inst.Abt.559	...	1	1	12	2	1	8	...	2
Pz.Kpfw. Wkst.Kp. (Eisb.) 658	2	13	1	17	2	1	4	3	...
Krupp Drucken-Müller, Berlin	2	1	1	1	...	...	...	...	...
Auto-Union, Stettin	12	...	...	...	1	...	...	...	...
Auto-Union, Stargard		...	...	...	...	10	...	...	...
Hans Dau, Stettin	...	...	...	...	...	...	5	...	...
Total	**16**	**15**	**3**	**30**	**5**	**12**	**17**	**3**	**2**

Performance of the Panzerberge-Dienste in February 1945

Pz.Bergekompanie 559 (in the area AOK 11, and Pz.AOK 3)

Zgkw.18t	*(12/3) (operational/undergoing repair)*
Tiefladeanh.	*(5/-)*
Bergepanther	*(3/1)*
Recovered:	*39 Pz.Kpfw., 4 Stu.Gesch., 3 SF, 4 Pz.Spähwg. and 2 Zgkw.*

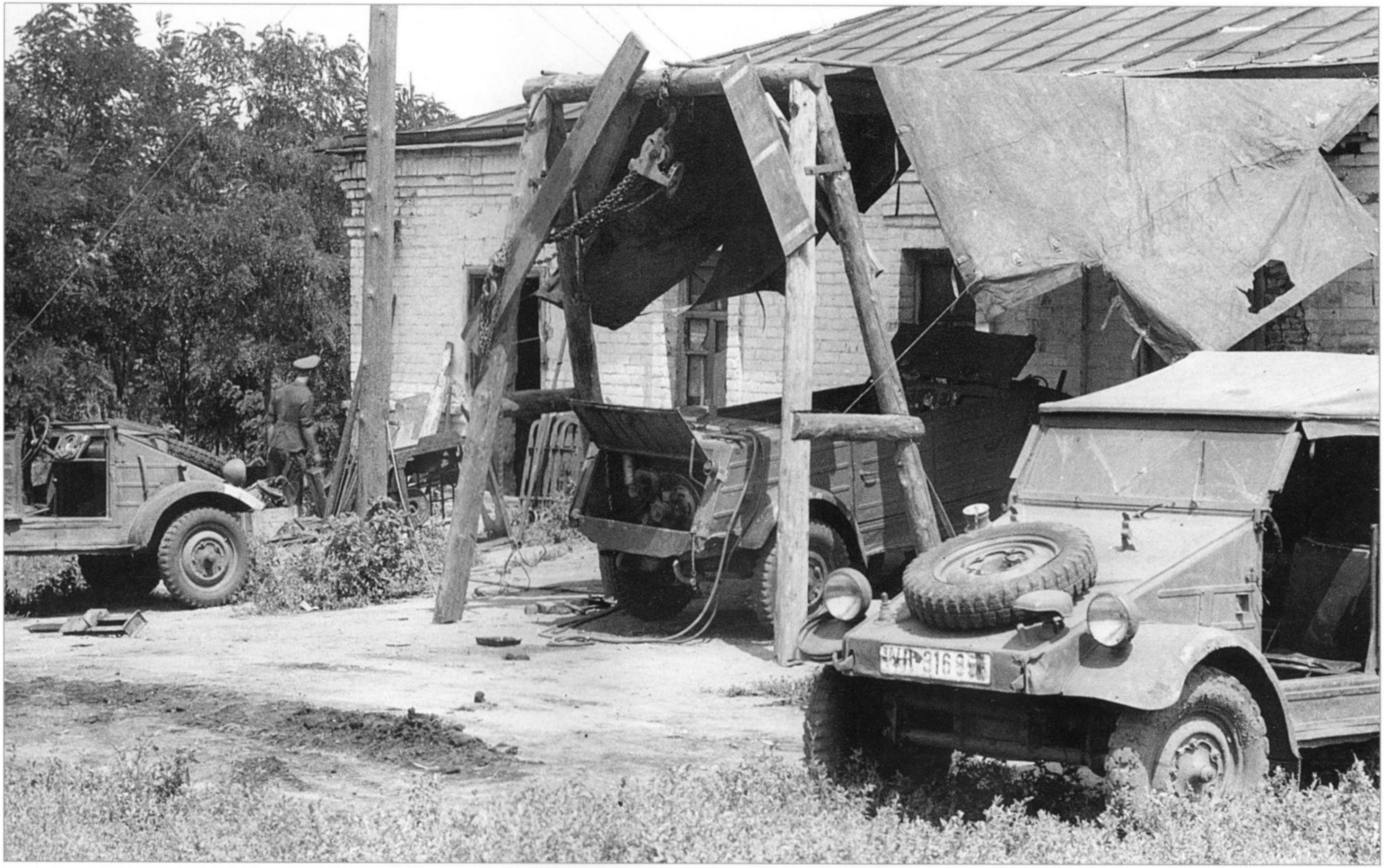
Pz.Bergekompanie 2 (in the area AOK 2)

Zgkw.18t	*(18/2)*
Tiefladeanh.	*(4/1)*
Recovered:	*20 Pz.Kpfw., 6 Stu.Gesch., 2 SF and 3 SPW.*

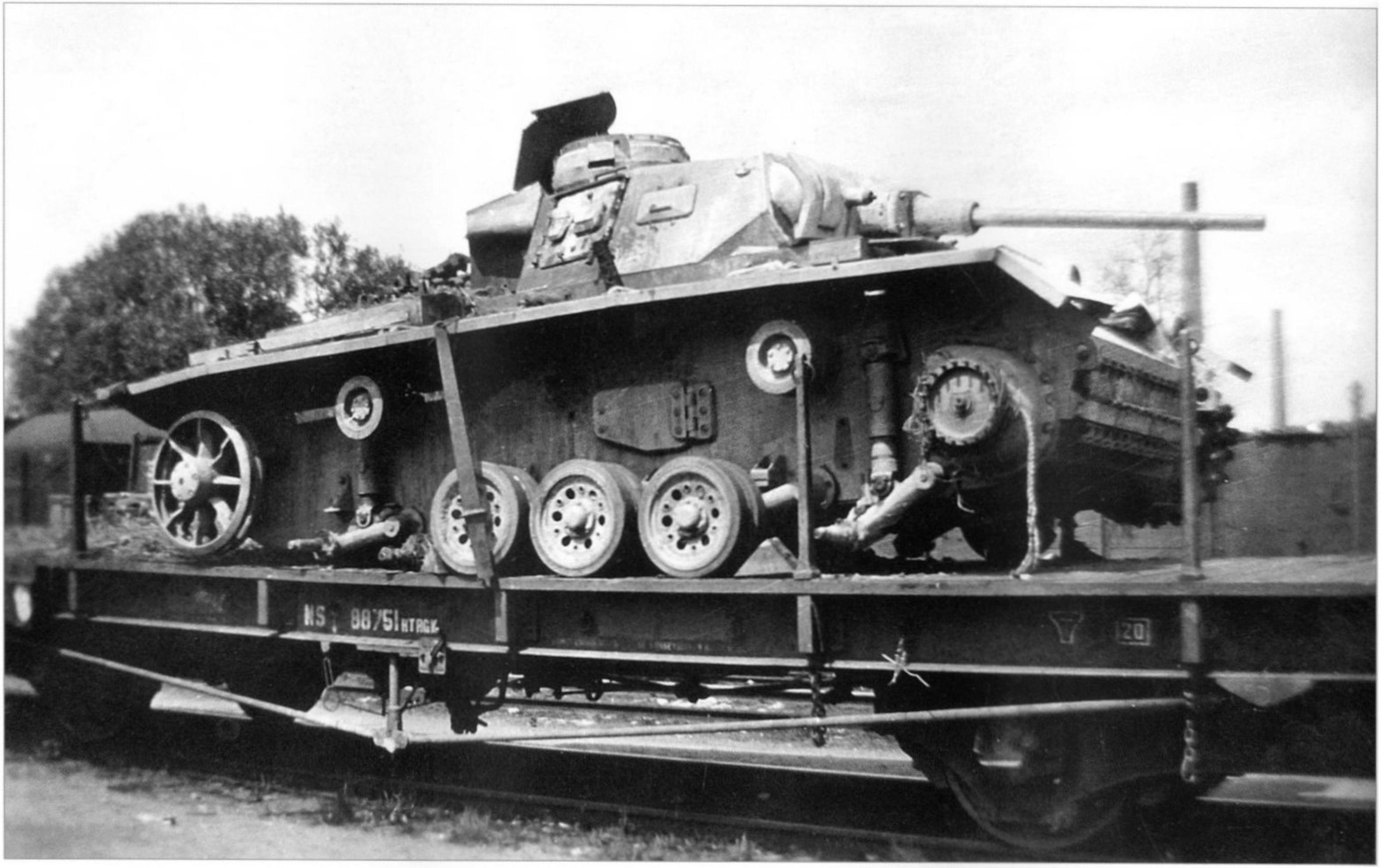
Kraftzug-Staffel (in the area AOK 9)

Zgkw.18t	*(8/-)*
Recovered:	*22 Pz.Kpfw., 19 Stu.Gesch. and Jagdpz.*

▶ This is how German Panzermen looked in the field, fooling around behind a Pz.Befehls.Wg Panther. *JH*



▲ Volkswagen type 82 in Kaniw, Ukraine. Some reports indicated that the type 82 was preferred over the 'Schwimmwagen', for example because it was lighter and could be pulled from the mud easily. *AMC*



▲ A Pz.Kpfw.III Ausf. L on the 'road' to Germany. It appears to have the remains of a whitewash over its paintwork. *AMC*

K-Werk and Heimatinstandsetzung

The order OKH/ (Chef Rüst.u.BdE) - 76k12 - No. 2841/44 AHA/In 6 (Z/Ing.) from 8 April 1944 stated about the principles of Panzer maintenance:

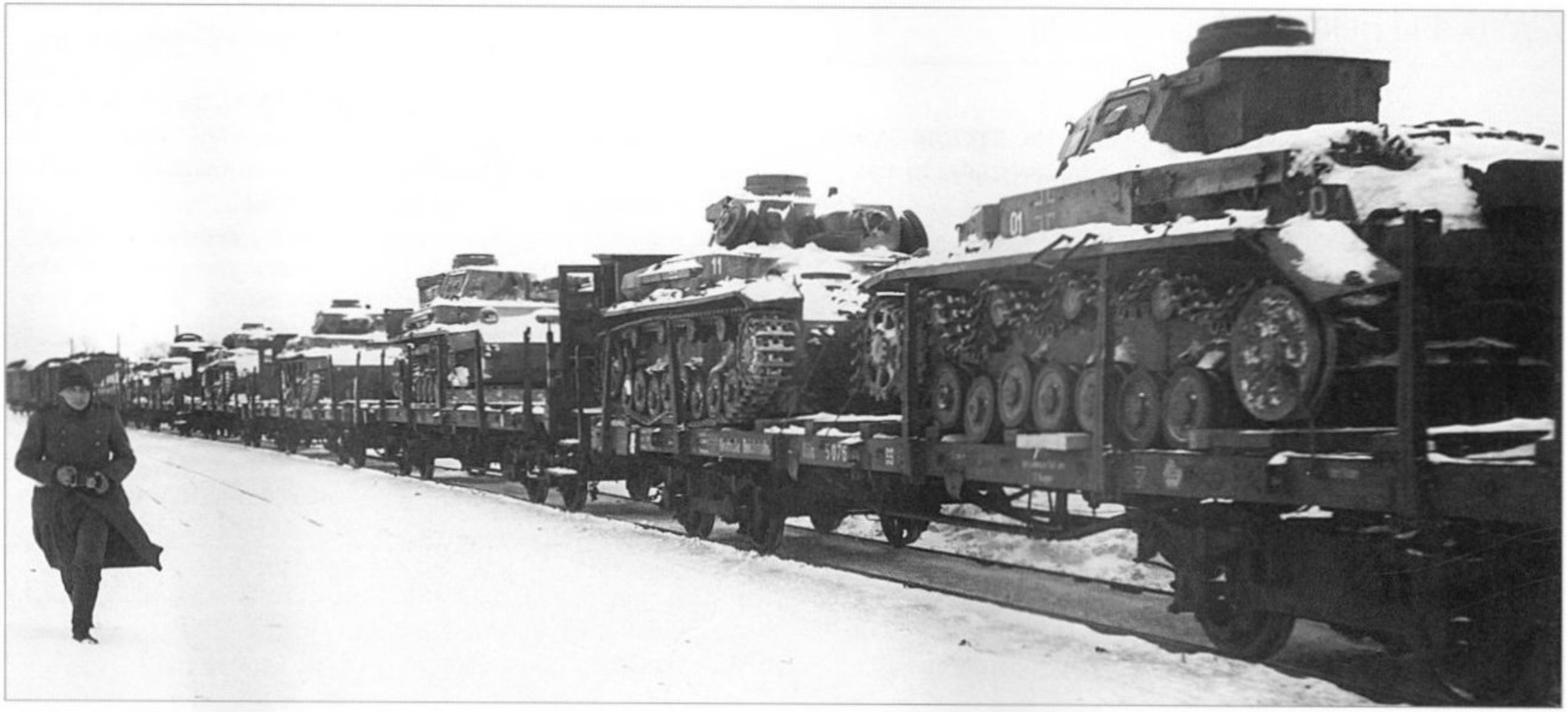
> *Maintenance of Pz.Kpfw. is to be performed in the Pz.Wkst.Kp. if possible. To speed up maintenance, exchange components must be used, especially during troop deployment. As long as there is the time and opportunity, overhauling of components needing maintenance through the troops is to be undertaken.*
> *Armored vehicles which cannot be repaired with certainty, also under difficult circumstances, must be sent to the homeland early enough. The decision about the evacuation to the homeland is made by the Heeresgruppen. They also arrange transportation. From the Eastern front the vehicles are forwarded to the homeland by the Pz.-Instandsetzungs-Gruppen of the K-Werke on behalf of the Heeresgruppe.*
> *Within possibilities only one type of armored vehicle shall be loaded on a wagon.*
>
> - *Pz.Kpfw., Stu.Gesch., Pz.Jäg., Gesch.Wg. and Pz.Sp.Wg. from the Eastern and South Eastern theater of war (Balkans) are to be sent to H.Pz.N.Za. Oppeln/Oberschlesien, all other theaters (including Scandinavia) are to be sent to H.Pz.Za. Königsborn-Magdeburg.*
> - *Pz.Sp.Wg. and Pz.Fu.Wg. to H.Pz.N.Za. Frankfurt (Oder). Armored vehicles sent to the Heereszeugämter and Heimatinstandsetzungswerke for maintenance must be removed from the unit's inventory.*
>
> *For maintaining the chassis of Schütz.Pz.Wg. the same regulations as to Zgkw. maintenance apply. Superstructures of Schütz.Pz.Wg. shall be repaired by the Panzer-Instandsetzungsdienste.*
>
> *If armored vehicles of foreign origin cannot be repaired by the troops, they are to be sent:*
>
> - *French design Pz.Inst.Abt. (static), Paris.*
> - *Russian origin Pz.Inst.-K-Werk North, Riga.*
> - *Italian origin Pz.Inst.Abt. (static) in the OAE-Werk, Bologna.*
>
> *If possible, only complete, non salvaged armored vehicles with weapons, optics, radios, vehicles accessories, tools, vehicle documents including the manuals, but without ammunition, shall be sent to the Pz.Inst.Abt. and K-Werke.*
> *For the immediate demand of the troops, shortage and main expendable spare parts can be removed from the armored vehicles meant for homeland maintenance prior to their evacuation.*

Because of the fact that when a unit sent its Panzer to a K-Werk or even the homeland it had to be erased from their inventory list and did not return to the unit, the troops decided to drag around heavily damaged Panzers for weeks until they could be repaired or they cannibalized them for spare parts. This was not what the authorities had in mind and they adapted their regulations to make handing their Panzers over to a K-Werk or Heimant-Instandsetzung for maintenance more attractive: The Panzers should now remain property of the delivering troop outfit.

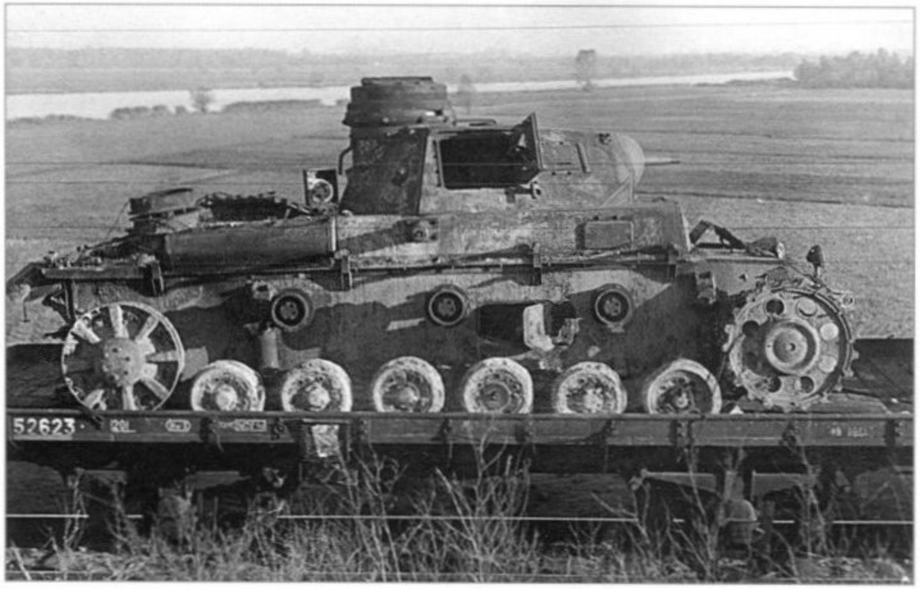
OKH/GenStdH/GenQu/Abt.III, 21 October 1943:

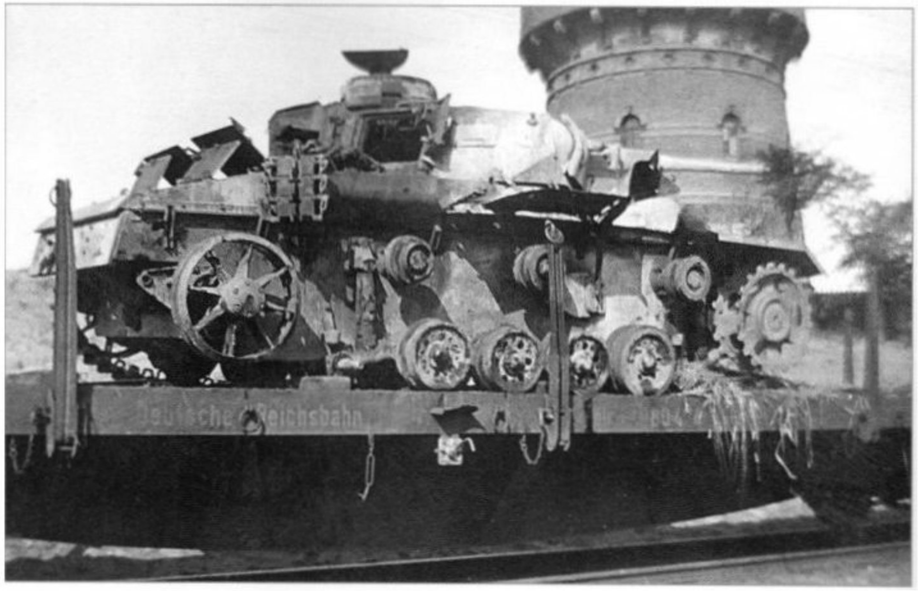
> *The armored vehicles sent to the homeland for maintenance henceforth remain property of the delivering troop outfit and will be returned to it after maintenance has been carried out. This measure shall be executed as follows:*
> *When maintenance of Pz.Kpfw., Stu.Gesch, Art.Sf., Pak-Sf., Pz.Späh-, Pz.Fu.-Wg., Schtz.Pz.Wg. and gep.Kfz. on Panzer chassis cannot be carried out by the troops or a Panzer-Instandsetzungs-Abteilung, they have to be handed over to a Panzer-Instandsetzungs-K-Werk. The Panzer-Instandsetzungs-K-Werk then decides if maintenance in the homeland is necessary. The Panzer-Instandsetzungs-K-Werk initiate the evacuation of the Panzers and armored vehicles to the Heeres-Zeugämter.*
> *Pz.Kpfw. of all kind, Pz.Bef.Wg., Stu.Gesch, Pak-Sf. and Artl.Sf., are to be sent to Heeres-Panzer-Zeugamt Königsborn-Magdeburg.*
>
> *Pz.Sp.Wg and Pz.Fu.Wg. are sent to Panzerspähwagen-*

▶ Pz.Kpfw.IV from 8.Pz.Div. From the front the first Pz. can be identified as No.11 from 8.Kp, then No.01, and the forth Pz. as No.14. *LA*



▼ Crippled Pz.Kpfw.III on their way home. On the left is an Ausf.E or an early Ausf.F with 3,7cm gun on its way from France, November 1940. *AMC, LA*





> *Ersatzteillager Frankfurt/Oder.*
> *Schtz.Pz.Wg. are sent to the Heeres-Panzer-Nebenzeugamt Spandau.*
> *The evacuation has to be reported to OKH/GenStdH/GenQu/Gr.V(K)III, Chef H Rüst.u.BdE/AHA In 6, Aussenstelle AHA/Fz In b/GenStdH/GenQu and the 'Stammtruppenteil'. The Chef H Rüst.u.BdE distributes the armored vehicles to the individual manufacturers.*
> *Armored vehicles that can no longer be repaired are reported by Chef H Rüst.u.BdE to OKH/GenStdH/GenQu/Gr.V(K)III and Aussenstelle AHA/Fz In b/GenStdH/GenQu by specifying Fgst. No. and 'Stammtruppenteil'.*
> *The vehicles repaired by the manufacturers are then collected in the Heeres-Zeugämter. Chef H Rüst.u.BdE informs GenStdH/GenQu about the type of repaired Kfz under specification of Fgst. No., 'Stammtruppenteil' and the readiness for shipment.*
> *From the Heeres-Zeugämter the delivery to the troops is carried out as with new vehicles out of production by OKH/GenStdH/GenQu.*
> *Escorts do not follow to the homeland, but are sent back from the Panzer-Instandsetzungs-K-Werk to their troops.*
> *Excluded from that order are Pz.Kpfw.II, Pz.Kpfw.III, Pz.Kpfw.38(t), s.Pz.Fu.Wg.263, le.Pz.Fu.Wg.260 and 261. These vehicles do not return to their troop but have their armament exchanged and are newly distributed by the OKH based on new planning.*
> *Vehicles turned over to homeland maintenance have to be deducted from the current inventory of the troops.*

A month later, on 27 November 1943, the Gen St d H/Gen Qu Abt. III noted that :

> *Evacuation of damaged Panzers and armored vehicles did not noticeably increase despite the preceding order that entitled the units to get their Panzers back. Under all circumstances long-term maintenance has to be sent to the homeland to relieve the Panzer-Instandsetzungsdienste, especially since during disengagements those damaged vehicles are tying up recovery means of the troops at the expense of recovery in the front line. Because the ordered reinforcement of the Panzer-Instandsetzungsdienste is only slowly making an impact, and many difficulties in spare parts production cannot be overcome at short notice, evacuation to the homeland has to be enforced by all means.*
> *The chief of transport ('Chef des Transportwesen') has been asked to take charge so that the necessary special wagons from supply trains and troop movements in the Armee area are standing by for damaged Panzers.*

On 2 December 1943, the Organisationsabteilung IIIb answered that it thought:

> *An immediate Panzer replacement in exchange for damaged Panzers for long-term maintenance is basically appropriate, but in regard to the already insufficient Panzer supply impossible, as this would mean further fragmentation.*

On 8 December 1943, General Wehring, Höh.Kdr.d.K.5 insisted that Pz.Kpfw. in long-term maintenance needed to be sent to the homeland. According to a telex of H.Gr. South, Pz.Kpfw. that need less than eight days to be repaired, shall be repaired within the troops; over 8 days shall be sent to Pz.Inst.Gruppe South in Berditschew if spare parts are available. All other damaged Panzers shall be sent to the homeland. He went on to point out that new Panzers were assigned depending upon the 'Fehlstellen' (shortfalls of authorized numbers). The troops thus did themselves no favor by keeping the long-term maintenance Panzers in their inventory. The Pz.Inst.-Dienste were even authorized to remove useful parts from the Panzers to be sent to the homeland, to quickly finish other Panzers in short-term maintenance.

On 12 December 1943, the Panzeroffizier at the Chef GenStdH presented the following statistics about Panzer sent for maintenance from the east to the homeland in November 1943:

Pz.Kpfw.II	*4*	
Pz.Kpfw.III	*74*	
Pz.Kpfw.IV	*89*	
Pz.Kpfw.V	*20*	
Pz.Kpfw.VI	*14*	
Stu.Gesch.	*57*	
Pak (Sf)	*25*	
Art. (Sf) Wespe	*6*	
Art. (Sf) Hummel	*7*	
S.I.G. (Sf) 38t	*9*	
Pz.Sp.Wg.	*31*	
SPW	*73*	
Total	***409***	*(Panzers: 201)*

Different numbers are given in the appendix to a report from the Gen Qu/Abt. III from 23 January 1944. The difference in numbers comes from the difference between 'sent' and 'arrived' in the homeland (Table 1).

Another appendix made from Gruppe V(K) III dated 2 January 1944 gives a total of 273 for November and 357 for December (RH 10-52/77). However, these numbers can only give a feel of the overall situation. A statistic or a generalization cannot be made.

Interestingly, after measures were taken to increase evacuation of damaged Panzers and armored vehicles to the homeland in October 1943, already in January 1944 the delegation for Panzer- and weapons-spare parts and maintenance at the Ministry for Armaments and War Production noted that the homeland cannot process the evacuated Panzers. The words of the delegate from January 20, (presentation notice from Gen Qu/Abt. III from 23 January 1944) were noted literally:

> *The Panzer maintenance in the homeland is ending in disaster. The Heimatinstandsetzung cannot process the evacuated Panzers. Despite all preparations the companies are not capable of accepting further Panzers. Among the Panzers delivered are also vehicles with relatively little damage.*

The delegate remarked further:

> *The homeland has totally insufficient capacity for maintaining Panzers. There is a particular shortage of cranes for heavy Panzers. At the moment, a maximum of 250 Panzers can be repaired. An improved performance is entirely dependent upon the allocation of laborers.*

He also stated that with the current system the Panzer-Instandsetzungs-K-Werke are not used to full capacity.

Speer noted on 27 January 1944 about meetings with the Führer from 25 - 28 January 1944:

> *The Führer requests that the evacuation of Panzers to the homeland and their maintenance be pushed even harder. Even if the number of evacuated Panzers will surpass the maintenance capacity, the Panzers shall be evacuated because only in this way can a thorough overhaul be guaranteed (Saur).*

In the appendix Gen Qu/Abt. III from 23 January 1944, a comparison is made between the maintenance performance of the field army and the homeland. See tables 2 and 3 on the opposite page.

However, these numbers are again not consistent with another document found from a Gruppe V (J) document about Panzer maintenance performance by Army Group South (Table 4).

Date of Arrival	II	III	IV	V	VI	Stu.G	Pak Sf.	Art Sf.	Total	Grand total
November 1943	9	74	66	32	3	69	12	8	273	…
December 1943	4	59	98	28	18	82	53	24	366	639
1-20 January '44	3	38	114	67	13	58	8	10	311	950

◀ Table 1: Panzer and Panzer chassis arrived in the homeland (Gen Qu/Abt. III from 23 January 1944, RH 10-52/99).

	October 1943			November 1943			December 1943		
Army Group	Pz.III/IV/V/VI	Stu.Gesch.	Sf. inc II/38	Pz.III/IV/V/VI	Stu.Gesch.	Sf. inc II/38	Pz.III/IV/V/VI	Stu.Gesch.	Sf. inc II/38
North	47	21	…	82	8	3	61	32	5
Middle	324	352	49	285	395	34	423	410	42
South	500	184	135	416	182	143	679	320	156
A	…	37	…	…	58	…	…	53	…
East Total	871	594	184	783	643	180	1163	815	203
Other Army Groups	102	58	16	128	55	15	131	58	21
Feldheer Total	973	652	200	911	698	195	1294	873	224
Monthly Total		1825			1804			2391	

◀ Table 2: Maintenance performance of the field army October to December 1943 (RH 10-52/98).

	October 1943			November 1943			December 1943		
	Pz.III/IV/V/VI	Stu.Gesch.	Sf. inc II/38	Pz.III/IV/V/VI	Stu.Gesch.	Sf. inc II/38	Pz.III/IV/V/VI	Stu.Gesch.	Sf. inc II/38
Pool of work in Homeland	473	85	179	588	106	214	687	139	190
Homeland Maintenance Total	62	22	60	90	19	43	57	41	33
Monthly Total		144			152			131	

◀ Table 3: Maintenance performance of the homeland October to December 1943 (according to data from H.Wa./WuG 6, RH 10-52/98).

Date	Repaired Panzers				Total Repaired Pz.	Repaired Stu.Gesch.	Total Repairs
	III	IV	V	VI			
July	463	306	173	180	1122	237	1359
August	430	374	21	128	953	351	1304
September	267	303	63	99	732	151	883
October	194	217	71	32	514 + 300*= 814	158 + 100* = 258	1072*
November	156	269	112	112	649 + 300* = 949	225 + 100* = 325	1274*
December					will be handed in later		

◀ Table 4: Maintenance performance by Army Group South according to a Gruppe V (J) document in appendix 11 (RH 10-52/90). * Estimates by Army Group South since reports are incomplete due to the fighting situation.

▲ These wrecks of a Pz.IV (Ausf.F1) and a Pz.III, seemingly photographed in Aug42. If this is true then it is astonishing that these wrecks remained untouched all summer of 1942. See p.185 of RtP1 for another photo from the same location in Kharkov. *AMC*

Manufacturers repaired Panzers under contract by the Wa J Rue (WuG 6). Other maintenance facilities such as Pschelautsch, the Arsenal Wien or the Panzer-Instandsetzungs-K-Werke repaired Panzers without contracts.

On the opposite page is a summarized overview of Panzers repaired at the manufacturers in the homeland including conversions and upgunning since 5 September 1939 based on information from the Wa J Rue (WuG 6). These Panzers were listed as total write-offs by the units but cannot be counted as total losses since they eventually returned to the front again.

Sometimes low output numbers in the reports were explained. For example, in February 1943 with conversions: Pz.Kpfw.II into Pak 40 and lFH 18, sPak into Stu.Ka.40 (L 48) and Pz.Kpfw.38(t) in Sfl. auf 38(t) 7,62cm and Pak 40. Accompanying documents that separately listed the conversions made survived from the months September and October 1943 and are given as examples here:

Pz.Kpfw.II auf Sfl. Pak 40 (7,5cm)	***Sept/Oct 1943***
Firma M.A.N., Nuernberg	*8/5 pieces*
Firma Famo, Breslau	*11/3 pieces*
Firma Skoda, Pilsen	*3/5 pieces*
Total	*22/13 pieces*

Pz.Kpfw.38(t) auf Sfl. Pak 40 (7,5cm)	
H.Kfz.-Wkst Pschelautsch	*33/8 pieces*

Pz.Kpfw.III von L 42 und L 60 (5cm) to L 24 (7,5cm)	
Firma Rueter, Langenhagen	*4/2 pieces*
Firma Seibert, Aschaffenburg	*8/3 pieces*
Firma Daimler-Benz, Ostwerk	*12/4 pieces*
Heeres-Kfz.-Werkstatt Wien	*0/1 piece*
Total	*24/10 pieces*

▶ This StuG III was sent back to the Heereszeugamt at Magdeburg for repair in the homeland. *AK*

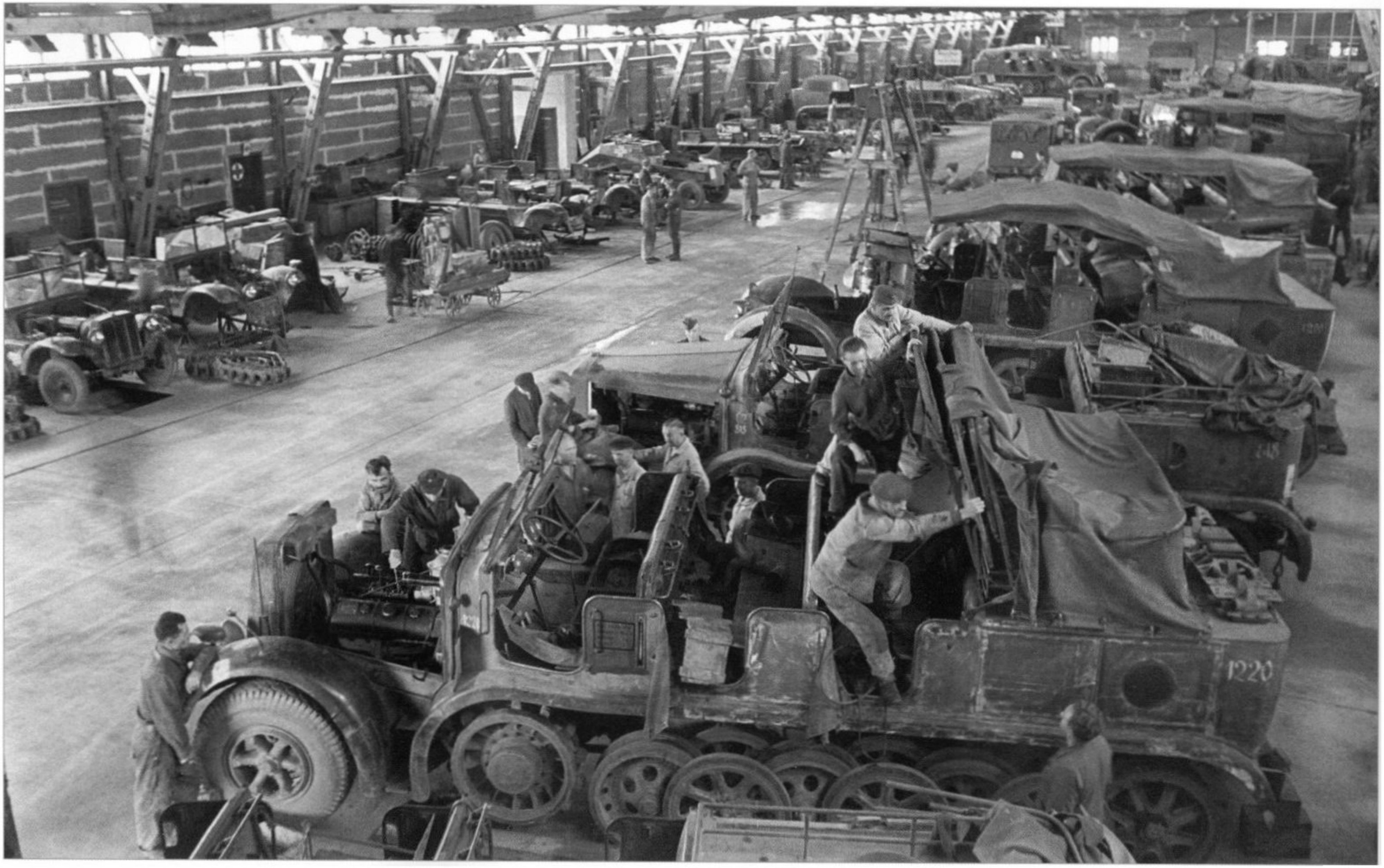
Panzers Repaired in the Homeland since 5 September 1939

Date	Delivered	Repaired	Scrapped	Maintenance
PzKpfw. I including kl.PzBefWg				
31.12.40	1094	781	42	271
31.12.41	1854	1721*	59	74
31.12.42	2176	1957	86	95
01.01.44	2295	2143	104	46
PzKpfw. II				
31.12.40	549	394	63	92
31.12.41	847	689	80	78
31.12.42	1202	909	164	128
01.01.44	1516	1183	206	110
PzKpfw. III inc. PzBefWg III				
31.12.40	305	197	20	88
31.12.41	831	625	46	160
31.12.42	1392	910	111	370
01.01.44	2043	1514	190	384
PzKpfw. IV				
31.12.40	177	105	5	67
31.12.41	305	219	18	68
31.12.42	556	354	58	136
01.01.44	983	606	90	302
PzKpfw. 38(t)				
31.12.40	45	20	8	17
31.12.41	251	116	44	91
31.12.42	601	247	49	306
01.01.44	816	694	82	34
PzKpfw. 35(t)				
31.12.40	207	177	12	18
31.12.41	246	203	18	25
31.12.42	320	285	18	13
01.01.44	326	302	18	6
Stu.Gesch.				
31.12.40	1	1	0	0
31.12.41	44	34	0	0
31.12.42	222	138	8	76
01.01.44	437	302	25	144
Beutepanzer				
31.12.42	50	5	0	45
Pz.Kpfw. V				
01.01.44	79	3	20**	84
Pz.Kpfw. VI				
31.01.43	2	...	0	2

* Includes training vehicles.

** 14 repaired Panther chassis were handed over to series production

Note: April 1943 is missing, so an unknown number must be added to every consecutive month. Handwritten notes on the originals were ignored.



▲ An entire team of workers was necessary to evaluate and prepare vehicles prior to overhaul. A m.Zgkw.8t (Sd.Kfz.7) stands front and center. In the back is a Sd.Kfz.250 of which 413 were built from Jun40 - Sep41. *BArch 101I-698-0021-08A*

Appendix

Type Diversity 244

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Type Diversity

While basically every Panzer's history was documented in great detail, wheeled vehicles were seldom kept track of in the same detail. In the reports that survived until now, the non-fully tracked vehicles are mostly divided only into Krad (motorcycle), Pkw, Lkw and Zgkw. It is unique to find such a detailed type report as the following from 5.Panzerdivision as of 1 July 1942. It makes clear in what low numbers different types were held and also that the same make and type could still be from different years of construction. Unfortunately, the second part regarding foreign makes, consecutively lettered "B. Foreign Make" is missing.

Krad

Number	Make	Type	Year	Kfz.-Type
20	D.K.W.	NZ 350	1938	
81	D.K.W.	NZ 350	1939	
180	D.K.W.	NZ 350	1940	
189	D.K.W.	NZ 350	1941	
22	Zündapp	KS 600	1939	
12	Zündapp	KS 600	1940	
33	Zündapp	KS 600	1941	
4	B.M.W.	R 12	1936	
3	B.M.W.	R 12	1937	
9	B.M.W.	R 12	1938	
53	B.M.W.	R 12	1939	
26	B.M.W.	R 12	1940	
2	B.M.W.	R 12	1941	

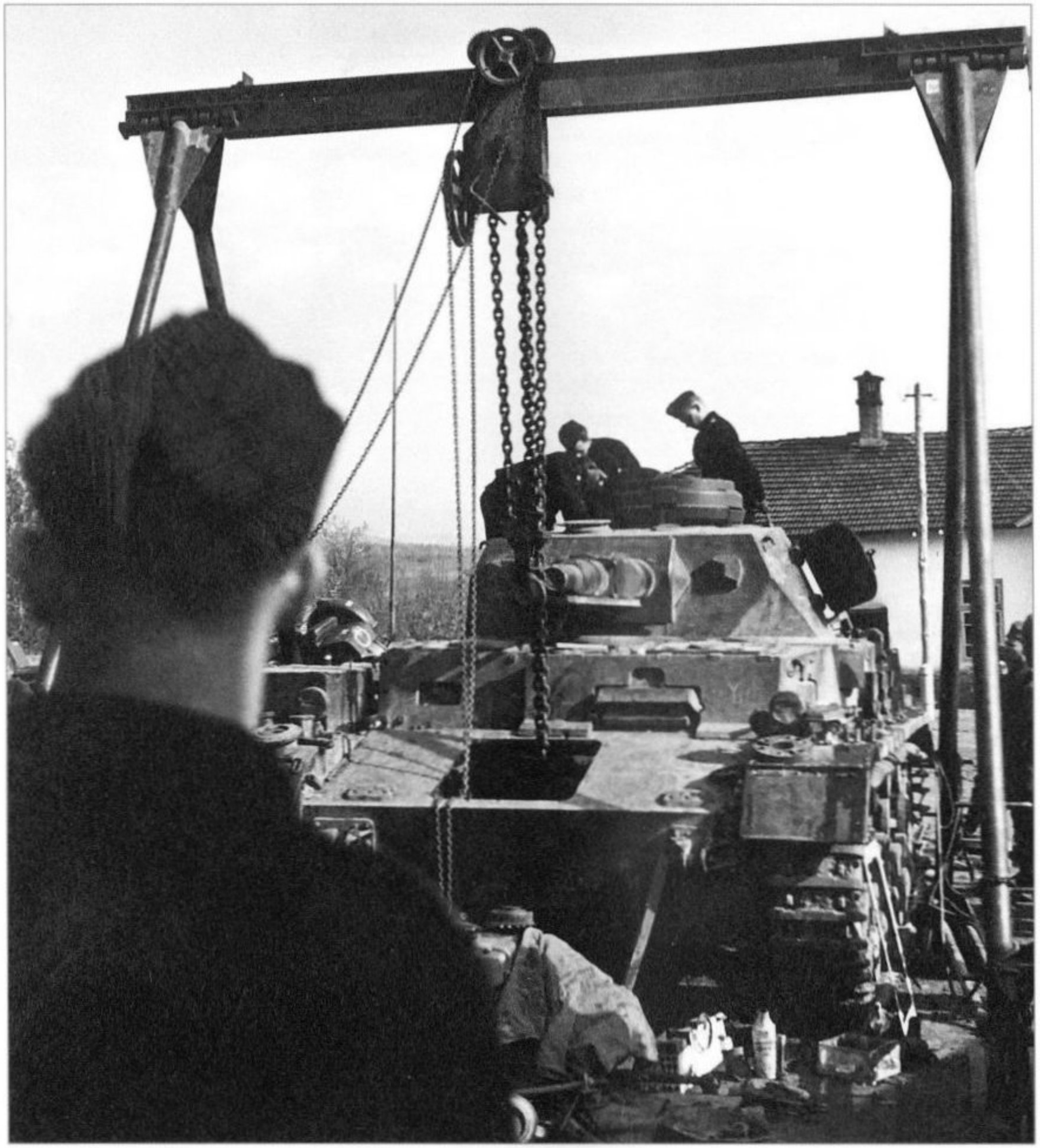
Pkw

Number	Make	Type	Year	Kfz.-Type
143	Volkswagen	KdF-Wagen	1941	
2	B.M.W.	1. E. Pkw (325)	1937	Kfz. 4
3	B.M.W.	1. E. Pkw (325)	1938	Kfz. 4
3	B.M.W.	1. E. Pkw (325)	1939	Kfz. 4
1	B.M.W.	1. E. Pkw (325)	1940	Kfz. 4
1	B.M.W.	3,5 Ltr.	1939	
12	Ford	V s	1939	
11	Ford	V s	1940	
8	Ford	V s	1941	
4	Hanomag	1. E. Pkw.	1938	Kfz. 2
22	Hanomag	1. E. Pkw	1939	Kfz. 2
3	Hanomag	1. E. Pkw	1940	Kfz. 2
1	Horch	5,0 Ltr.	1938	
5	Horch	m. E. Pkw. (901)	1937	Kfz. 15, 16, 17
36	Horch	m. E. Pkw. (901)	1938	Kfz. 15, 16, 17
30	Horch	m. E. Pkw. (901)	1939	Kfz. 15, 16, 17
33	Horch	m. E. Pkw. (901)	1940	Kfz. 15, 16, 17
126	Horch	m. E. Pkw. (901)	1941	Kfz. 15, 16, 17
18	Horch	108	1938	Kfz. 70
1	Horch	108	1939	Kfz. 70
9	Horch	108	1940	Kfz. 70
18	Horch	108	1941	Kfz. 70
10	Opel	Kadett	1937	
93	Opel	Kadett	1938	
54	Opel	Kadett	1939	
2	Opel	Kadett	1940	
15	Opel	Kadett	1941	
1	Opel	Olympia 1,3	1935	
2	Opel	Olympia 1,3	1936	
16	Opel	Olympia 1,3	1937	
73	Opel	Olympia 1,5	1938	
43	Opel	Olympia 1,5	1939	
2	Opel	Olympia 1,5	1941	
3	Opel	Super 6	1937	
16	Opel	Super 6	1938	
5	Opel	Super 6	1939	

Number	Make	Type	Year	Kfz.-Type
3	Opel	Super 6	1940	
4	Opel	Kapitän	1938	
41	Opel	Kapitän	1939	
2	Opel	Kapitän	1940	
1	Opel	Kapitän	1941	
5	Opel	Admiral	1938	
10	Opel	Admiral	1939	
2	Opel	Admiral	1940	
22	Opel	m. E. Pkw	1938	Kfz. 15
13	Opel	m. E. Pkw	1939	Kfz. 15
1	Opel	m. E. Pkw	1940	Kfz. 15
28	Opel	m. E. Pkw	1941	Kfz. 15
3	Stoewer	l. E. Pkw	1937	Kfz. 1, 2
10	Stoewer	l. E. Pkw	1938	Kfz. 1, 2
9	Stoewer	l. E. Pkw	1939	Kfz. 1, 2
34	Stoewer	l. E. Pkw	1940	Kfz. 1, 2
66	Stoewer	l. E. Pkw	1941	Kfz. 1, 2
3	Wanderer	m. E. Pkw (901)	1939	Kfz. 15, 17
16	Wanderer	m. E. Pkw (901)	1940	Kfz. 15, 17
66	Wanderer	m. E. Pkw (901)	1941	Kfz. 15, 17

Lkw

Number	Make	Type	Year	Kfz.-Type
2	E.D.	HWA 526	1936	l. gl. Lkw
8	E.D.	HWA 526	1937	l. gl. Lkw
72	E.D.	HWA 526	1938	l. gl. Lkw
27	E.D.	HWA 526	1939	l. gl. Lkw
24	E.D.	HWA 526	1940	l. gl. Lkw
1	Borgward	Merkur III	1938	
1	Buessing	LD 5	1941	
15	Buessing	LD 6	1940	
15	Buessing	LD 6	1941	
16	Buessing	500 S	1941	
1	Buessing	500 A	1941	
1	Buessing	550 N	1939	
347	Damiler-B.	L 3000 S	1941	
97	Damiler-B.	L 3000 A	1941	
18	Damiler-B.	L 4500 S	1941	
1	Damiler-B.	L 4500 A	1941	
1	Damiler-B.	L 2000	1939	
38	Ford	V 8	1938	
1	Ford	V 8	1939	
2	Ford	V 8	1940	
127	Ford	V 8	1941	
1	Henschel	33 D 1	1935	
3	Henschel	33 D 1	1937	
8	Henschel	33 D 1	1938	
10	Henschel	33 D 1	1939	
4	Henschel	33 D 1	1940	
1	Henschel	40 S	1935	
1	Henschel	40 S	1937	
1	Krupp	L 2 H 43	1934	Kfz. 70
6	Krupp	L 2 H 43	1935	Kfz. 70
8	Krupp	L 2 H 43	1936	Kfz. 70
8	Krupp	L 2 H 143	1937	Kfz. 70 [sic]
26	Krupp	L 2 H 143	1938	Kfz. 69/70
11	Krupp	L 2 H 143	1939	Kfz. 69/70
72	Krupp	L 2 H 143	1940	Kfz. 69/70
18	Krupp	L 2 H 143	1941	Kfz. 69/70
6	Magirus	33 G 1	1938	
3	Magirus	33 G 1	1939	
2	Magirus	33 G 1	1940	
1	Magirus	L 145	1938	
4	Magirus	L 145	1939	
1	Magirus	L 145	1940	
139	Magirus	330 A	1941	



▲ A Panzerkampfwagen IV Ausf.E (6./B.W.) of 9.Pz.Div. photographed in May 1941. The Panzer is under the larger version of the two most common gantry cranes seen with the field troops as also shown on page 142. *AMC*

Number	Make	Type	Year	Kfz.-Type
13	Magirus	330 S	1941	
1	M.A.N.	E 2	1940	
1	M.A.N.	NON 6/31	1939	
1	Opel	Blitz 2,5 Ltr.	1940	Kfz. 31
59	Opel	Blitz 2,5 Ltr.	1941	Kfz. 31
5	Opel	Blitz 3,6 Ltr.	1937	
88	Opel	Blitz 3,6 Ltr.	1938	
55	Opel	Blitz 3,6 Ltr.	1939	
83	Opel	Blitz 3,6 Ltr.	1940	
69	Opel	Blitz 3,6 Ltr.	1941	
35	Opel	Blitz 3,6 l (Allr.)	1941	
33	Saurer	4 ETDv	1941	

Zgkw.

Number	Make	Type	Year	Kfz.-Type
18	D 7	1t	1939	
51	D 7	1t	1940	
22	D 7	1t	1941	
2	D 7p	Sd.Kfz. 253	1940	
4	HL 42	Sd.Kfz. 253	1941	
1	HLm 10	8t	1941	
7	HLm 11	8t	1940	
1	KMm 11	8t	1938	
7	KMm 11	8t	1939	
5	KMm 11	8t	1940	
1	KMm 11	8t	1941	
10	BNL 8	5t	1938	
15	BN 9	5t	1939	
2	F2	18t	1939	
2	F3	18t	1940	
1	F3	18t	1941	

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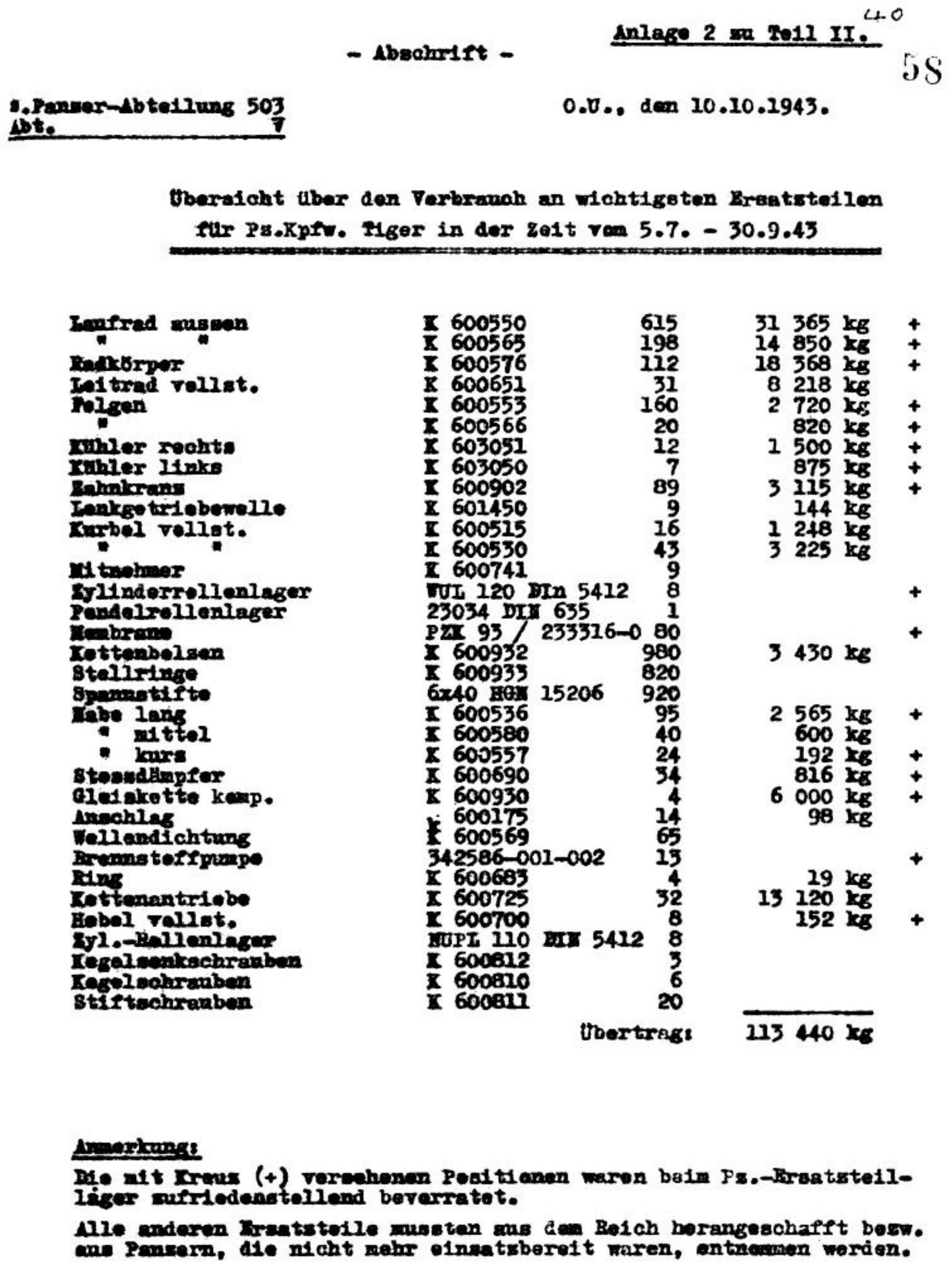

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- Abschrift -

Anlage 2 zu Teil II.

s.Panzer-Abteilung 503
Abt. V

O.U., den 10.10.1943.

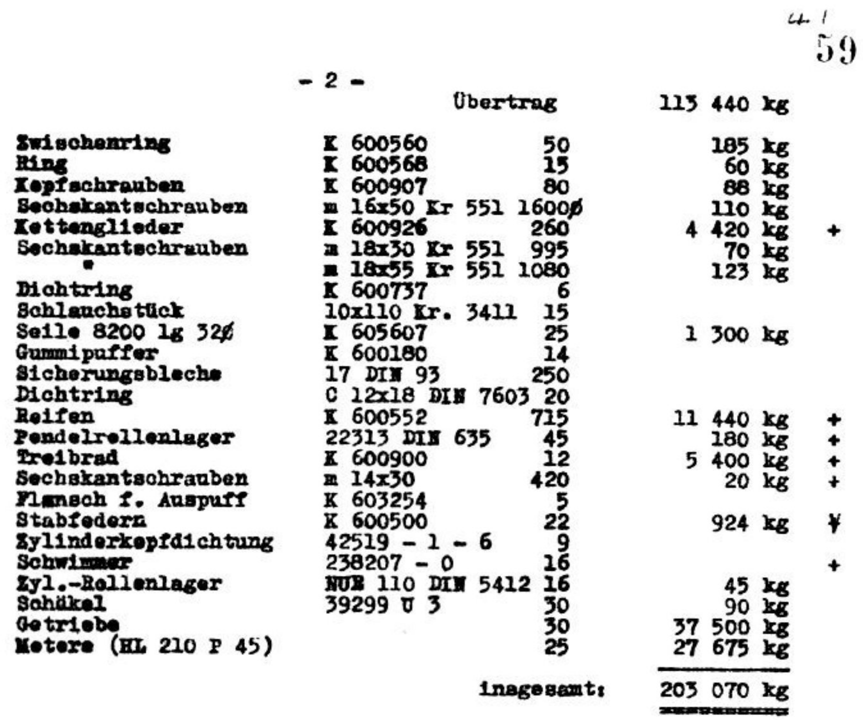
Übersicht über den Verbrauch an wichtigsten Ersatzteilen
für Pz.Kpfw. Tiger in der Zeit vom 5.7. - 30.9.43

Laufrad aussen	K 600550	615	31 365 kg	+
" "	K 600565	198	14 850 kg	+
Radkörper	K 600576	112	18 368 kg	+
Leitrad vollst.	K 600651	31	8 218 kg	
Felgen	K 600553	160	2 720 kg	+
"	K 600566	20	820 kg	+
Kühler rechts	K 603051	12	1 500 kg	+
Kühler links	K 603050	7	875 kg	+
Zahnkranz	K 600902	89	3 115 kg	+
Lenkgetriebewelle	K 601450	9	144 kg	
Kurbel vollst.	K 600515	16	1 248 kg	
" "	K 600530	43	3 225 kg	
Mitnehmer	K 600741	9		
Zylinderrollenlager	WUL 120 DIn 5412	8		+
Pendelrollenlager	23034 DIN 635	1		
Membrane	PZK 93 / 233316-0	80		+
Kettenbolzen	K 600932	980	3 430 kg	
Stellringe	K 600933	820		
Spannstifte	6x40 HGN 15206	920		
Nabe lang	K 600536	95	2 565 kg	+
" mittel	K 600580	40	600 kg	
" kurz	K 600557	24	192 kg	+
Stossdämpfer	K 600690	34	816 kg	+
Gleiskette komp.	K 600930	4	6 000 kg	+
Anschlag	K 600175	14	98 kg	
Wellendichtung	K 600569	65		
Brennstoffpumpe	342586-001-002	13		+
Ring	K 600683	4	19 kg	
Kettenantriebe	K 600725	32	13 120 kg	
Hebel vollst.	K 600700	8	152 kg	+
Zyl.-Rollenlager	NUPL 110 DIN 5412	8		
Kegelsenkschrauben	K 600812	3		
Kegelschrauben	K 600810	6		
Stiftschrauben	K 600811	20		
		Übertrag:	113 440 kg	

Anmerkung:

Die mit Kreuz (+) versehenen Positionen waren beim Pz.-Ersatzteillager zufriedenstellend bevorratet.

Alle anderen Ersatzteile mussten aus dem Reich herangeschafft bzw. aus Panzern, die nicht mehr einsatzbereit waren, entnommen werden.



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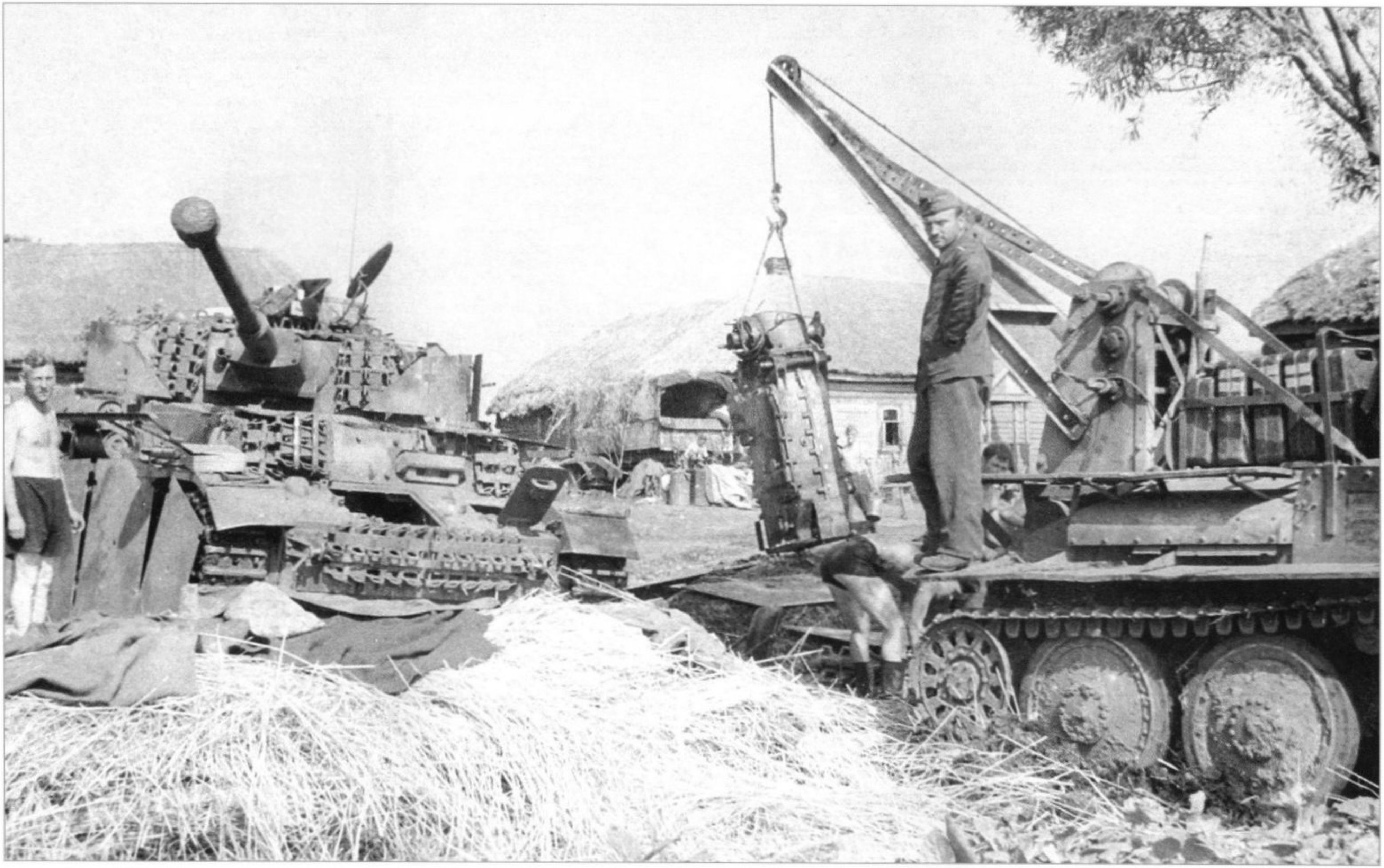
- 2 -

		Übertrag	113 440 kg	
Zwischenring	K 600560	50	185 kg	
Ring	K 600568	15	60 kg	
Kopfschrauben	K 600907	80	88 kg	
Sechskantschrauben	m 16x50 Kr 551	16000	110 kg	
Kettenglieder	K 600926	260	4 420 kg	+
Sechskantschrauben	m 18x30 Kr 551	995	70 kg	
"	m 18x55 Kr 551	1080	123 kg	
Dichtring	K 600737	6		
Schlauchstück	10x110 Kr. 3411	15		
Seile 8200 lg 320	K 605607	25	1 300 kg	
Gummipuffer	K 600180	14		
Sicherungsbleche	17 DIN 93	250		
Dichtring	C 12x18 DIN 7603	20		
Reifen	K 600552	715	11 440 kg	+
Pendelrollenlager	22313 DIN 635	45	180 kg	+
Triebrad	K 600900	12	5 400 kg	+
Sechskantschrauben	m 14x30	420	20 kg	+
Flansch f. Auspuff	K 603254	5		
Stabfedern	K 600500	22	924 kg	+
Zylinderkopfdichtung	42519 - 1 - 6	9		
Schwimmer	238207 - 0	16		+
Zyl.-Rollenlager	NUB 110 DIN 5412	16	45 kg	
Schäkel	39299 U 3	30	90 kg	
Getriebe		30	37 500 kg	
Motore (HL 210 P 45)		25	27 675 kg	
		insgesamt:	203 070 kg	

Overview from s.Pz.Abt.503 about their consumption of the most important spare parts for Pz.Kpfw. Tiger in the period from 5 July – 30 September 1943. The positions marked with a '+' were amply available at the Panzer spare part depot. All other spare parts had to be procured from the Reich or from other non-operational Panzers. *BA-MA*



▲ A Pz.Kpfw.IV with its lower side skirts detached and lots of spare track links as extra armor. It has its transmission removed by a crane custom fitted on a Czech Pz.38(t) chassis. Note the position of the Balkenkreuz on the turret side skirts. *AMC*

Why did the Blitz against Russia fail? How did winter and desert conditions affect operational readiness? Why weren't captured Russian vehicles pressed into service like French and other vehicles were? What was the purpose of the 'Panzerstützpunkt' of 1944? What kept heavy Panzers from mixing in with lighter Panzers? What really caused the loss of brand new Panzers?

The answers to these and other questions can be found here in Vol. 2 of "Repairing the Panzers." Based solely on original experience reports, diaries and manuals, you will learn how small parts led to big problems, how herculean efforts led to diminishing returns, and, for the first time, you will go behind the scenes and learn how reliable the infamous Panthers and Tigers really were.

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